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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.
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A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

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ELECTRO-PLATERS REVIEW.

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COPPER AND NICKEL IN AMMUNITION

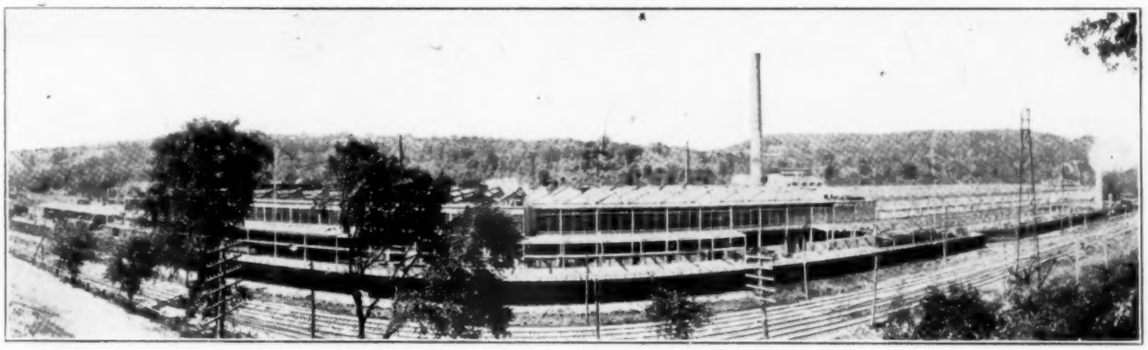
A DESCRIPTION OF THE MANUFACTURE OF CUPRO-NICKEL FOR BULLET JACKETS.

BY GEORGE LYON, JR.

Cupro-nickel is one of the munition mixtures, and during the past year its output has vastly increased. It is used largely in the manufacture of bullet jackets, for which purpose, on account of its non-corrosive qualities, it is admirably adapted. It is, however, a difficult alloy to make and causes the brass manufacturers more trouble than all of the other mixtures put together. Most of the trouble occurs in the casting shop, where only an experienced caster should be allowed to handle the casting part of the work and everything possible should be done to favor the metal.

To employ inexperienced help, and overcome all difficulties by using a pyrometer to ascertain the proper pouring temperature. To burn soft coal in the casting shop. To melt the metal in a forced draft, tilting, coke furnace, using a crucible, and weighing off 500 pounds of metal.

It is safe to say that all of these people will have considerable difficulty in making cupro-nickel, and if any of them succeed in making cupro-nickel suitable for rolling mill purposes, they will have added appreciably to the knowledge of the handling of that metal.



THE NEW PLANT OF CHASE METAL COMPANY AT WATERVILLE, CONN.

To the layman the casting of cupro-nickel is very simple. All there is to it is to melt some copper and nickel and when the metal is thoroughly mixed pour it into a mold. Any caster, however, will tell you that there is more satisfaction and certainty of results in pouring a dozen pots of the brass mixtures than in pouring one pot of cupro-nickel.

With copper at 20 cents per pound and nickel at 60 cents per pound, the cost of the base metal per pound is about 26 cents. At the present selling price of the finished metal this would seem to give ample room for profit, and this apparent profit has been a great temptation to concerns to engage in its manufacture. The present manufacturers of brass, knowing the difficulty of making cupro-nickel, have founght shy of it, but such has not been the case with outsiders.

During the past six months several parties have made preparations to engage in its manufacture and get some of this profit. Few of them have had any experience in rolling mill work, but all were sure they could improve on the present method of handling the metal. Among the "improvements" that these promoters of new plants expect to use might be mentioned the following:

Cupro-nickel is usually composed of 85 parts copper and 15 parts nickel. The best grade of either Lake or electrolytic copper should be used. The past year has exploded the idea that Lake copper only can be used for the munition mixtures—if for no other reason than that there is not enough Lake copper to go around. Equally good results are obtained with Lake or electrolytic.

Commercial nickel comes on the market in five forms: Shot, grain, cube, button and cathode. All of these forms are in use today and good results are being obtained.

A good, hot fire is necessary for melting cupro-nickel, and for this purpose the regular square pit natural draft furnace, burning hard coal, gives as good results as any. The furnace should be of such size as to allow for a layer of coal six inches deep for the crucible to rest on and have the top of the crucible below the opening leading into the flue, and have about three inches of coal space on the sides. In actual use square furnaces are more economical than round ones. This is contrary to the theorists, who insist the coal burned in the corners of the square furnace is wasted. These same corners, however, come in handy when the tongs are put on the crucible, and if round furnaces were used the diameter of the

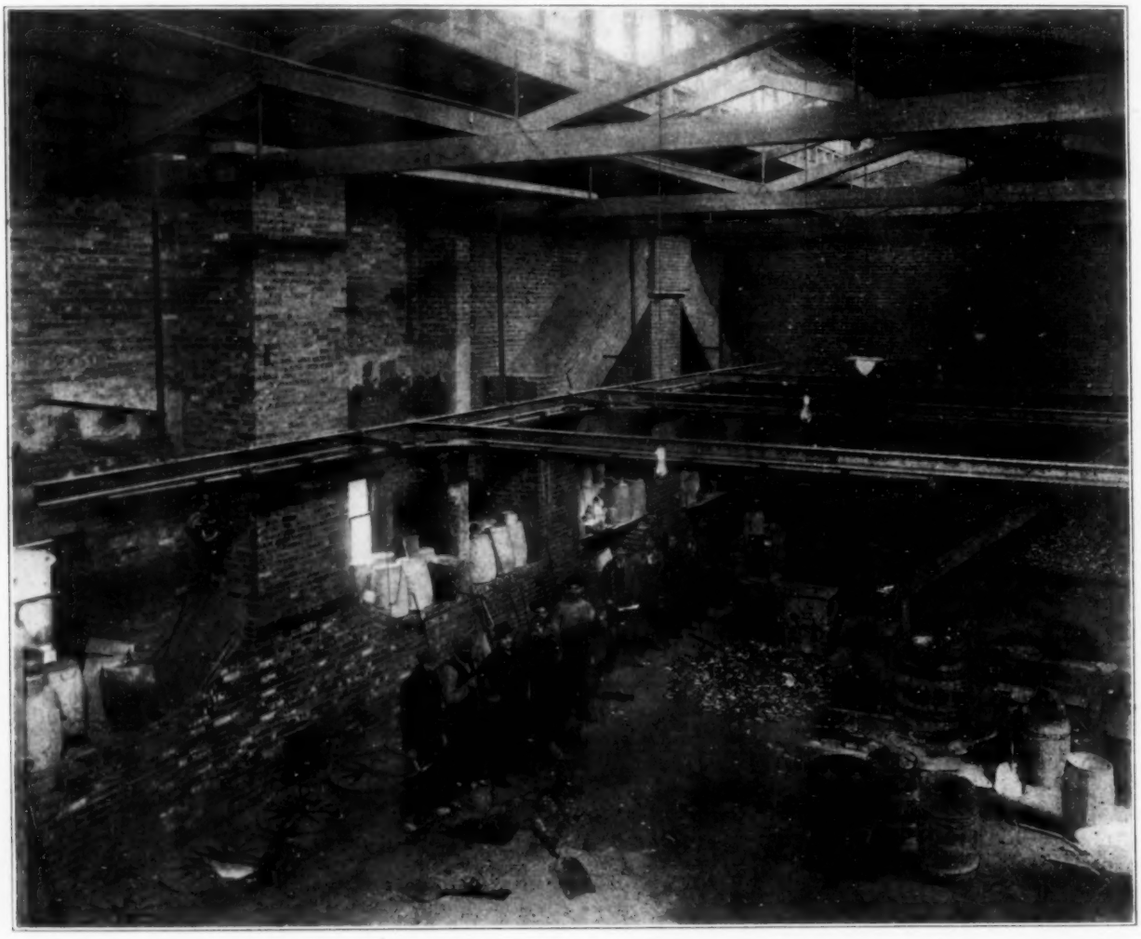
furnace would have to be increased to allow for space for tongs.

The best Lehigh egg coal should be burned. It must be hard and shiny, free from slate, and of about the following analysis:

Carbon	91.5
Hydrogen	3.5
Nitrogen	0.3
Sulphur	0.6
Oxygen	2.6
Ash and water	1.5
	100.0

but should be broken in with a common brass mixture. This leaves a thin scale or coating which protects the iron. The usual width of mold is about 4½ inches.

Prime winter lard oil makes the best mold dressing and in the long run is the cheapest. Its cost, however, is high and some casting shops use what is called a "mold oil." This is a mixture of cheaper oils, usually with a linseed oil or cylinder oil base and having a high flash test. Casting shops using mold oil succeed with it on the cheaper mixtures of brass, but for cupro-nickel lard oil gives the best results. With whatever grade of oil is used there is mixed enough china clay (talc and graphite are also used) to slightly thicken the oil which is then applied



A VIEW OF THE FOUNDRY OF THE UNITED SMELTING AND ALUMINUM COMPANY, NEW HAVEN, CONN. NOTE THE OVERHEAD CARRYING SYSTEM.

The new building of the company is designed in such a way as to give a maximum of floor space, light and comfort to each department. It is built in two sections. In one section the offices are laid out, allowing the erection of a reception room and three private offices on one side, with the general offices and directors' room extending the length of the other side. A narrow hallway intervenes, several doors on either side allowing access to either the general or private offices. Directly in back of the offices is a large spacious storage room, where shipments, after being weighed and sorted, are properly marked ready to find their way into the foundry, which is just in back—extending across the entire length of the building, seventeen furnaces being in constant operation. Here also is the overhead carrying system, the pots filled with molten metal being pulled from the furnaces, and with the greatest ease moved to the proper pouring station. The other section of the building is the receiving and shipping department, and also a storage room for new stock of ingots, sheets, rods, etc.

If possible a forced draft should be avoided.

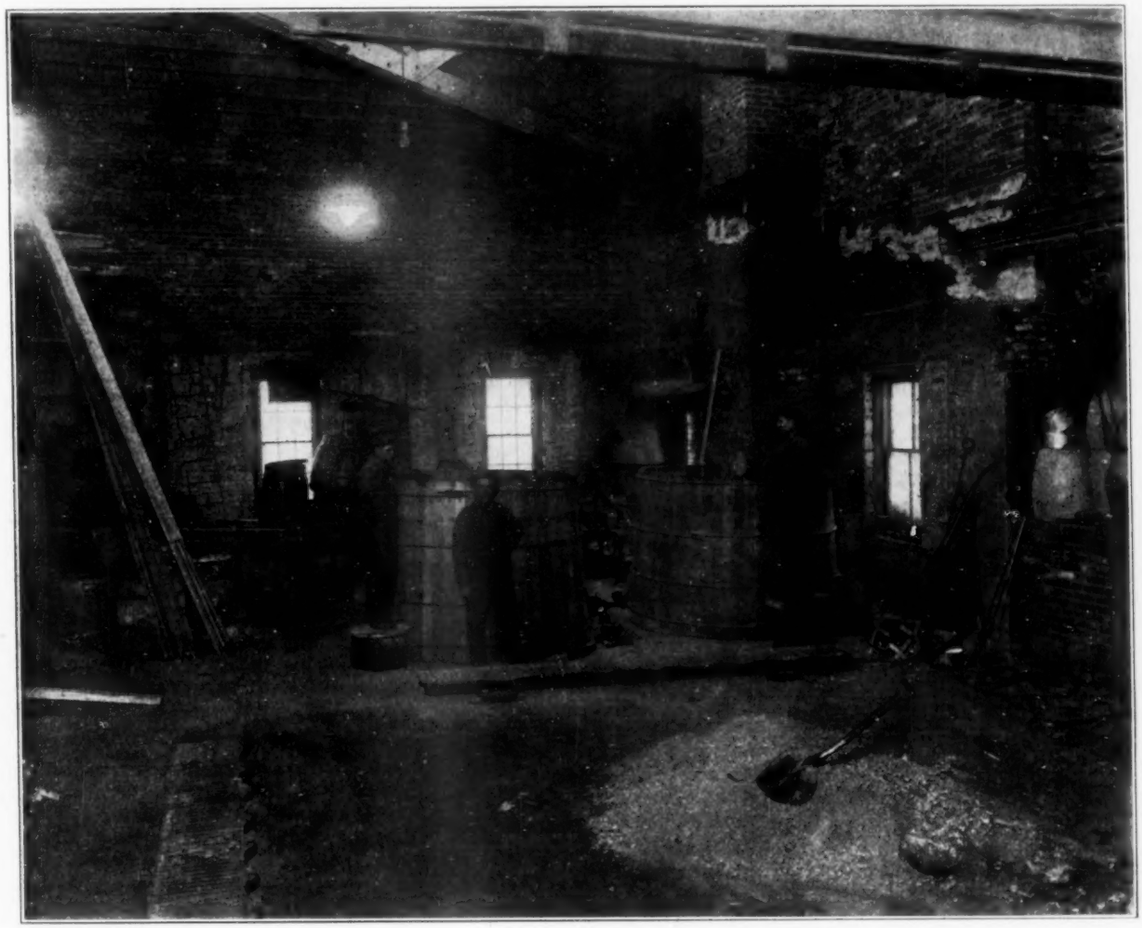
A good graphite crucible holding 150 to 175 pounds of metal gives the best results. Larger melts do not give satisfaction. The regular two pieces mold may be used, the "match" mold having preference over the "box" mold. The "match" mold gives the metal the greatest freedom in shrinking, and the bars of metal are less apt to have shrinkage cracks than when the match mold is used. The mold should not be used the first time for cupro-nickel, to the mold with a brush. Care must be taken to see that all of the inside surface of the mold is covered as bare spots are apt to cause the metal to "blow." The mold is then faced off with graphite and after the mold is banded together about a tablespoonful of graphite is put in the bottom. This steadies the metal while it is being poured, and gives the bar of metal a smooth surface. The different casting shops vary the use of china clay, talc and graphite, but the above will give as good results as any.

Graphite stirrers and skimmers are best for wrought iron, if kept for any length of time in molten cupronickel, will be dissolved and particles of iron enter the metal.

There are several methods used in melting cupronickel, but as all seem to give equally good results the personal element must be the deciding factor. Some of these methods are as follows: In the bottom of the crucible place a layer of charcoal, then put the scrap on the charcoal (if no scrap is used put in two pigs of copper) and on top of this the nickel. When all is melted add the copper. The whole should be kept well covered with charcoal. Another method is to use charcoal and and the copper on top. When melted fill up with heavy scrap. (The light scrap is melted and poured into ingots.) Keep covered with charcoal. Or melt equal parts of copper and nickel and pour into ingots. These ingots are remelted along with new copper.

Whichever of the above methods is used the metal must be kept covered with charcoal and care taken to be sure the nickel is melted. It is easy to be deceived about the nickel as it "floats," but at no time should the metal be forced into the crucible by pushing it down with stirring rod or tongs, as porous metal is likely to be the result.

When all new metal is melted a flux is not necessary.



A VIEW IN THE PLANT OF THE UNITED SMELTING AND ALUMINUM COMPANY, NEW HAVEN, CONN., SHOWING THE TANKS USED IN MAKING GRANULATED ALUMINUM.

On the upper floors are located the laboratories of the company, and the preparation department, in which the material is made ready for the furnaces. The laboratory occupies the front wing, and the preparation department is in the rear end. Here are located the dryers, separators, crushers, shears, etc. The material is prepared here, ready for the fires, and is then lowered into the melting room by conveyors. The basement floor of the building is also used for the storage of material, which is conveyed by an electrical elevator to the preparation department, and from there to the melting furnaces. The directorate of the company consists of Abe Lapides, Louis Lapides and Harris Lapides. L. M. Brile, for a number of years with the U. S. Reduction Company of Chicago, is sales and advertising manager. The company maintains offices at 836 Penobscot Bldg., Detroit, Michigan, for the convenience of the trade in that section.

scrap, as mentioned above; when the scrap is melted put in the copper and keep well covered with charcoal, then when the whole has been brought to a dazzling white heat the (cathode) nickel is carefully placed with tongs into the crucible on top of the charcoal, and allowed to work its way through. Or place the nickel in the bottom of the crucible and the scrap on top, when melted add the copper and keep covered with charcoal. Or another method is to place the nickel in the bottom of the crucible

If part scrap is used some casting shops use borax as a flux and obtain about the same results as do those casting shops which use nothing but charcoal for a covering. One objection to the use of borax is that it attacks the walls of the crucible, and shortens its life. Another objection is that the action of the borax on the walls of the crucible allows the nickel to absorb carbon from the crucible, and causes the bar of metal to have small pinholes. These objections, however, are more technical

than real. The average number of heats from a crucible on cupro-nickel is from three to five heats, and this is not appreciably altered by the use or non-use of borax. If borax improves the metal it should be used. It is not the best practice, however, to put the borax in the bottom of the crucible, it should be added after some of the metal has melted. This prevents contact of the molten borax with the bottom of the crucible. About 25 per cent. of scrap cupro-nickel is all that can be used to advantage. If more is used the resulting metal is apt to be porous.

When the scrap amounts to more than 25 per cent. it is customary to melt it down and pour into ingots, and remelt these ingots along with new metal. As much care must be taken with this melting and pouring into ingots as if into bars for rolling. If the ingots are porous trouble will be experienced on the second melt. Some casting shops melt all of their stock (copper, nickel and scrap) and pour into ingots, and then remelt these ingots. This is called "refining." Refined metal seems to give about the same result as metal that has not been refined.

A de-oxidizer should be used and for this purpose manganese gives good results. From ¼ to ½ of one per cent. is all that is needed. Some use more and claim it increases the ductility of the metal. This is unnecessary as cupro-nickel is not a difficult metal to roll. The object in introducing manganese into the metal is to use it as a de-oxidizing agent to produce greater density and no more should be used than is necessary to acomplish that purpose. An overdose of manganese is likely to cause spills and blisters. Some producers of manganese advise that in the nickel alloys the amount of manganese used should be about 2 per cent. of the nickel content. This advice was misinterpreted in one casting shop and 2 per cent. of manganese used. The resulting metal was full of blisters and spills and could not be used. Either pure manganese or manganese-copper (30-70) may be tried, and should be added a few minutes before taking the crucible from the furnace.

Cupro-nickel should be poured hot. Much bad metal is caused by pouring at too low a temperature. When poured cold, or if the melting has not been done under proper conditions, the metal "swells" and porous castings result. Casters who have been sucessfully making cupro-nickel for years, claim they never have a pot so hot that it needs cooling off. In fact, among casters the opinion prevails that most of the trouble with cupro-nickel is caused by pouring at too low a temperature. The experienced eye is the best judge as to the right pouring temperature, but several aids are used. One is to allow the stirring bar to rest on the bottom of the crucible and hold it firmly with one hand. If right for pouring a decided vibration should be felt. Another is to push back the charcoal until the molten metal is exposed. When the surface of this exposed metal is disturbed it should show a bright, white mirror-like surface.

Before taking the crucible from the furnace the metal should be well stirred, giving the stirring bar an upward motion. This gives the metal a thorough mixing, and incidentally brings any dirt or charcoal to the surface. Most of the charcoal is skimmed off, but enough left to cover the metal. When the crucible is brought to the mold the remaining charcoal is pushed back and a block of wood placed on the pouring lip. This answers two purposes—it keeps back the charcoal while pouring and helps to prevent the formation of oxide. The metal should be poured in a steady stream and fast enough to bring all dirt to the top. If the stream of metal is split with a graphite skimmer or a stick of wood the bar of metal will have sharper and cleaner edges. Before sending to the rolling mill the gate is cut off and the end of the bar inspected, and, if necessary, recut until solid metal shows up.

In the rolling mill cupro-nickel is handled much the same as brass, and is usually annealed before breaking down. The metal is "tough" rather than "hard," and in this respect resembles some of the low brass mixtures, instead of German silver, with which, on account of its nickel content, it is sometimes compared. The pinches to be given will depend on size, strength and local conditions of each individual mill, but, generally speaking, may be about the same as for common brass.

The annealing is also similar to common brass, the chief difference being that it takes a slightly higher temperature. The following method of annealing has been sucessfully used. The temperature of the furnace is about 1,300 degrees Fahr., and after the metal is pulled in the heat is cut off and the metal allowed to soak for twenty to thirty minutes. This will bring the temperature down to about 1,100 degrees. The heat is again turned on and the temperature gradually brought up to 1,300 degrees and held there until the metal shows a clear red all through, when the temperature reduced and the metal allowed to soak for fifteen to twenty minutes and then pulled out. If quenched immediately by being drawn under a sprinkler or similar arrangement the pickling operation will be much easier. Some mills do not quench cupro-nickel, claiming it hardens the metal, but if it is done no trouble is experienced getting the metal soft.

Most of the mills overhaul their cupro-nickel, although some say it is not necessary. The reason for overhauling most metals is to remove dirt from the surface, but overhauling does not remove blisters and spills, nor make porous metal dense. If the melting has been done under favorable conditions the high temperature at which cupro-nickel is poured precludes the probability of dirt being entangled in the metal, and ought to make overhauling unnecessary. If the metal is not annealed before breaking down it should be looked over, and any charcoal adhering to the surface chipped out. Compared to overhauling this is a simple operation. If it is thought necessary to overhaul cupro-nickel it should be done when the metal is about ½ inch thick.

Pickling cupro-nickel is much more difficult than the common brass mixtures. It should be done after every annealing and care taken to prevent scale, pan dirt, etc., from being rolled into the metal. The annealing produces a heavy scale, which, if not removed, and in connection with pickle remaining on the surface of the metal, cuts a groove in the surface of the rolls which groove requires hours of grinding to remove.

The regular sulphuric acid bath, one part acid and nine parts water, is used. The metal is allowed to remain in the bath until all scale and dirt is loosened and is then washed off in clear water. The usual custom of taking the metal from the pickle and dropping it in a tub of water and then passing through the rolls is to be avoided, as all pickle is not washed out. This is especially so after the metal is in coils. A better method is to put the coil of metal under a sprinkler and thoroughly wash off. Hours of grinding may be saved by thorough pickling and washing off.

The finishing rolling should be of light pinches, so as to have as little variation as possible in the gauge of the metal, and for the last pass the rolls should be ground or the guides shifted in front of a smooth part of the rolls. The finishing gauges run from .034-.036 to .040-.042. The shearing is done while the metal is hard, the regular brass mill slitting machine being used. The width is about 4 inches.

The finishing anneal differs slightly from the other anneals in that the heat is not turned on as quickly and

the metal allowed to soak a little longer. The scleroscope test is about 19 or 20.

After the finishing anneal the metal is pickled as before, the pickle washed off with cold water and the metal then dipped in hot water, and allowed to dry for a minute or two. It is then put in a brightener or dip. There are several of these brighteners, one, which gives good results, is made by dissolving in the regular pickling solution, 3 or 4 ounces of red chromate of potash (potassium bichromate) to each gallon of solution used. The bichromate is first put in the water and the acid added. It is made in small quantities and when "dead" is thrown away.

Adding more "bichromate" does not give the best results. The pickle is used to clean the metal; the dip to brighten the surface, and the metal should remain in each solution long enough to accomplish its purpose. After the metal is taken out of the dip, it is washed off and passed through the regular sawdust drying out machine and sent to the inspection bench. All metal that passes the inspector is wound on an arbor about four inches in diameter and is then ready for the press room operations.

The first operation in the press room is "cupping" the metal. This is done on a double acting cam-press running about 120 revolutions per minute and having four or five punches. Four drawing operations follow. The first two draws are made on double friction dial drawing presses, with a speed of about 100 per minute. The last two draws are made on ratchet dial drawing presses, the speed of the machine being about 70 strokes per minute. The shells are then trimmed on a semi-automatic trimming lathe with a production of about 55 per minute.

After being trimmed the jackets are pointed on a ratchet dial press. Three successive operations are performed on the jacket before it is ejected from the press, the speed of which is about 65 strokes per minute. After pointing the jacket is ready for the slug. The slugs and jackets are assembled in a press with two dials, the bullets leaving the machine with the jackets closed over the end of the slugs.

The jacketed bullets are next put through a machine, the action of which is somewhat similar to the machine which rolls the milling on the edges of coins. This is called "Canneluring." After canneluring the bullets are pushed through a sizing die, and are ready for the loading operation.

The thickness of the walls of the jacket when finished is about .0125 of an inch. The diameter of the jacket varies from .300 of an inch in the U. S. Army to .315 of an inch in some of the European countries. All of the work in the press room is done without annealing.

A BRASS CARTRIDGE WITH CUPRO-NICKEL CASED BULLET.

COPPER ELECTROTYPING BATHS*

A Report of Tests Made by the Bureau of Standards, Washington, D. C.
At the Royal Electrotype Company of Philadelphia, Pa.

PRELIMINARY REPORT OF CONCLUSIONS.

From a recent investigation of copper deposition the following conclusions were reached, some of which have been pointed out by previous investigators. While these conclusions may have general applications, they are based only upon copper deposits about 0.008-inch thick, made upon graphited wax molds, in solutions containing only copper sulphate and sulphuric acid at temperatures from 25° to 40° C. (77° to 104° F.)

1. In general the finer the crystals, the higher the *tensile strength* and "hardness" of the copper.

2. The *ductility* (as measured by the permanent elongation after fracture) increases with the tensile strength up to a tensile strength of about 40,000 pounds per square inch, and then decreases, i. e., the copper becomes brittle.

3. The better the *agitation*, the better the quality of copper, especially with high current density (over 50 amperes per square foot).

4. Under otherwise uniform conditions an increase in the amount of *copper sulphate* causes slight increase in tensile strength.

5. Under otherwise uniform conditions an addition of *sulphuric acid* at low temperature (25° C. or 77° F.) increases the tensile strength; and at high temperature (40° C. or 104° F.) decreases the tensile strength.

6. A rise in *temperature* under otherwise uniform conditions always decreases the tensile strength ("softens" the copper). This effect of temperature is most marked with high acid content and with medium current density.

7. At *low* temperature, the higher the *current density* (up to 90 amperes per square foot) the higher the tensile strength (*i. e.*, the harder the copper).

8. At *high* temperature, an increase in *current density* up to 40 amperes per square foot causes a decrease in tensile strength. From 40 to 90 amperes per square foot the tensile strength increases.

9. It is believed that copper with a tensile strength of 35,000 to 40,000 pounds per square inch, and an elongation of 20 per cent. to 30 per cent. will be found satisfactory for electrotype plates, and is tentatively recommended for such purposes.

10. To obtain such copper the following conditions may be employed:

(a) *Agitation.* The solution should be thoroughly agitated, especially between the anodes and the cathodes.

(b) *Composition.* The solution should contain from 50 to 80 grams per liter (7 to 11 oz. gal.) of sulphuric acid, and from 250 to 200 grams per liter (34 to 27 oz. gal.) of copper sulphate. The specific gravity of the solution should be from 1.17 to 1.18 (21° to 22° Baumé). Whatever composition of solution is used it should be maintained nearly constant if uniform results are desired.

(c) *Temperature.* The solution should be maintained between 25° and 30° (75° to 85° F.). If over 75 amperes per square foot is used, the temperature may be kept at 35° C. (95° F.).

(d) *Current Density.* At low temperature, good results can be obtained by using from 40 to 90 amperes per square foot. At high temperature, from 75 to 90 amperes per square foot should be employed.

(e) The *voltage* necessary under the above conditions will vary from 1.5 to 3.0 volts (on each bath) if the current density is from 40 to 90 amperes per square foot.

These studies have not yet been entirely completed, especially certain microscopic tests. Details will be published in a Technologic Paper of the Bureau of Standards, and a discussion of their application will be included in a revised edition of Circular 52. Announcement of these publications will be made when they are available.

*Supplement to Circular 52, Study of Copper Electrotyping Baths. Published in The Metal Industry, January, 1915.

PROGRESS IN ELECTRO-PLATING

Copper, Bronze or Brass Plating and Electro Cleaning in the Same Solution.

By Charles H. Proctor.

The realization that it is possible to cleanse metals electrically and deposit a heavy coating of copper bronze or brass in the same solution in less than one-third of the time required in the ordinary solutions of cyanides and even acid solutions is of particular interest at the present time. The unusual conditions in Europe, and I might also say in the entire world, have produced abnormal conditions in the production of ferrous and non-ferrous metals which perhaps will continue for several years after the European struggle is ended.

Cost is always an important factor, so on every hand the manufacturer is adopting the same methods of more than a quarter of a century ago, when the French syndicate controlled the copper market of the world, forcing the manufacturer of metal goods to adopt the least cost of production and the use of iron and steel in the place of copper bronze or brass wherever possible. It was the abnormal condition created by the French syndicate in an effort to control the copper output of the world that became one of the greatest factors in the development of the electro-plating industry and forced the manufacturer to adopt the use of iron and steel in the manufacture of his products and electro-plate them to represent the respective metals. This was to lower the cost of production and to equalize the true market value of his products that exist under normal conditions.

The electro-plating industry is no doubt entering upon another phase of its development that will probably continue for years, as the impetus given withiu the past year, owing to the high cost of all metals, will no doubt continue with an ever-increasing demand for electro-plated products.

To economize in both labor and material costs is as important a factor in electro-plating as in other lines of industry and if the data furnished in this article accomplishes the purpose for which it is intended, the saving in cost of materials or labor, I shall feel fully repaid for my efforts.

The Metal Industry in 1913 published an article by E. G. Lovering entitled "The Brass and Copper Plating of the Future." The formula furnished gave very excellent results, but in the writer's estimation the proportion of cyanide specified was quite too small in proportion to the amount of copper and zinc carbonates given, consequently considerable metal was lost, because it must have remained in suspension in the solution undissolved owing to the use of too little cyanide.

Dr. Oliver P. Watts, of the University of Wisconsin, presented a paper upon the "Cleaning and Plating in the Same Solution"* at the twenty-seventh general meeting of the American Electro Chemical Society at Atlantic City, N. J., which created considerable interest, but although the paper went into detail more elaborately than the article written by Mr. Lovering and samples of the product from such solutions were displayed, nothing new was brought forth that would add to its importance over the formula proposed by Mr. Lovering.

It has always been realized that the production of a chemically clean surface was an important factor in the development of a successful electro-deposit. The materials used previous to the advent of the numerous special cleaners now on the market was German lump potash, caustic soda and sodium carbonate in the form of the crystallized salt or soda ash. Benzine and gasoline were used when the alkalies failed to give the desired results owing to saponification in solution of the greases or mineral oils. In the development of modern cleaners Kalye was the first and most important because of its very effective cleansing of all polished metal surfaces. Later the mineral cleaners appeared, the first as a by-product in the smelting and refining of aluminum; then other cleansers followed based upon the chemical combinations of the original mineral cleaner. The analysis of such cleaners are similar and they all owe their peculiar cleaning properties to the sodium hydroxide and carbonate and also to silicon and aluminum oxides. So that combinations of caustic soda, soda ash and sodium silicate will give equally as good, if not better results. Small amounts of aluminum oxide have been found beneficial, but as fixed quantities in the cleaners enumerated, they have been found detrimental, frequently depositing out when such materials are used for cleansing electrically and causing the deposits to fail in proper adhesiveness to the base metal.

Another cleanser which has proved very popular consists of commercial tri-sodium phosphate, borax and soda ash and the analysis shows as follows:

Dry tri-sodium phosphate	38.91%
Borax	5%
Soda ash	6.44%
Moisture	49.65%

An analysis of a well known special cleaner of the mineral type showed the following proportions:

Sodium carbonate	50.34%
Sodium hydroxide	10.06%
Oxide of silicon	17.77%
Oxide of aluminum	6.79%
Moisture	15.04%

In the formula which I will give for cleaning and plating in the same solution, I have considered the addition of sodium silicate and aluminum silicate as important factors in connection with the cleansing and plating operations when used in connection with the sodium carbonate and sodium hydroxide as separate factors. By omitting the cyanides and metal cyanides the combination may be used as a cleanser for metals, either electrically or otherwise. The combination of the alkalies may also be used for the deposition of zinc, tin, silver or gold by increasing or decreasing the proportions of materials mentioned and replacing the copper salts with similar metal salts to the metal that is desired to be deposited.

The following proportions give the best results upon iron, steel or other metals except aluminum:

Water	1 gallon.
Commercial sodium hydroxide	6 ounces.
Commercial soda ash	6 ounces.
Commercial sodium silicate (water glass)	1 ounce.
Aluminum silicate	¼ ounce.
Sodium cyanide 129%	1 ounce.
Copper cyanide (70 % metal, 30% cyanogen)	1 ounce.

The temperature should be 180 degrees and the voltage for iron and steel 6 volts; for die castings and other metals, 4 to 5 volts. The amperage for rapid deposits should be from 25 upwards per square foot of surface. The solution should be prepared in an iron tank with direct current as in plating, the tank being connected

*The Metal Industry, June, 1915.

direct with the positive current. Several anodes of the respective metal as that desired to be deposited should be connected direct with the tank. The negative or cathode pole must be insulated from tank and the negative current may be connected direct or by control through a rheostat that will allow a high amperage to pass with low resistance. The sodium salts should be dissolved in the order given in the formula followed by the addition of the sodium and aluminum silicates.

The sodium cyanide can then be dissolved in a small amount of hot water, 150 degrees, then the copper cyanide dissolved therein and mixed with the alkaline solution when copper plating is to be performed. By decreasing the amount of copper cyanide and adding zinc cyanide to the sodium cyanide so that the total proportions of metals salts in weight are always equal to the sodium cyanide, used bronze and brass deposits may be satisfactorily obtained in the same manner as equally good results can be obtained. Of course, anodes of the respective metals should be used in the manner heretofore mentioned.

Manufacturing concerns east and west are utilizing this solution with permission and have expressed the highest appreciation for the results obtained. One of these concerns is plating copper upon steel automobile bumpers to produce a high lustre finish previous to nickel-plating in three to four minutes, whereas previously it required ten minutes immersion in cyanide solutions made up with the carbonates of copper and forty-five minutes immersion in an acid copper solution.

Of course it requires amperage, but if you have plenty at your disposal you can deposit metal proportionately as fast. Another concern found it difficult to electro-galvanize a special casting on account of the excess of hydrogen occluded in the metal by the removal of sand silica, etc., in pickling. Not one of the ordinary cyanide solutions in which copper carbonates or zinc was used would deposit any metal upon such a surface, but the combination solution coated the casting uniformly in a few seconds.

In heat treatment operations the solution is giving wonderful results as heavy adherent coatings of copper can be obtained in a few minutes that required forty-five or more minutes in the ordinary solution. Again other concerns are using the solutions for heavy deposits of copper upon steel parts where a driving wedge or fit is desired and so I might continue to enumerate the advantages of the solution above specified. The solution is easy to control, requiring small additions of material to keep it working to its full capacity at a very low cost of maintenance.

ALUMINUM IN WAR MUNITIONS

A Brief Article on the Utilization of the Light Metal

By Alumina.

The uses of aluminum in the present war have far exceeded all anticipations and the demand upon the productive capacity of the various factories has become so great that the supply of the metal for industrial purposes has been considerably curtailed. The high prices ruling for copper and zinc during the early days of the war were effective in diverting the attention of munition buyers to aluminum. As an instance may be mentioned shrapnel time-fuses. The fuse for a typical 18-pound shrapnel shell forms the nose of the projectile and is conical in shape, being made up of four sections, two fixed and two movable. Until recently these parts were cast and machined in yellow brass, but since the early stages of the war aluminum has come into much wider use and at the present time the major part of the shrapnel fuses are being made of aluminum. The fuses are machined from solid extruded bar which gives a very tough and homogeneous product. Previously the parts were cast and subjected to hydraulic pressure, but the present process is both cheaper and more simple. Naturally an alloy of aluminum containing a few per cent of copper is employed so as to secure a harder product and to facilitate machining. When it is figured that the time fuse for a typical 18-pound shrapnel shell weighs nearly 1 pound and that these shells are being contracted for and consumed in million lots, it is not difficult to appreciate one of the causes for the present temporary shortage of the metal.

A much greater part in munition work is played by aluminum in the form of a high explosive. The violence with which, under certain circumstances, aluminum will combine with oxygen is well known; the Thermit process in everyday use being a typical example. Here iron oxide and finely granulated aluminum are introduced in a crucible and ignited by a magnesium cartridge. In the resulting reaction the oxygen is wholly displaced by the iron to the aluminum, the reaction at the same time producing sufficient heat to liquify the iron.

$$3\ Al + Fe_2\ O_3 = Al_2\ O_3 + 3\ Fe.$$

This reaction, although generating considerable heat and taking place in a confined area, is violent but not explosive because no gases are evolved and only solids and liquids are reacting. If, however, instead of iron oxide an oxidising agent be employed, the reaction is of a far different character. The compound used in this case is ammonium nitrate and the summated reaction is

$$2\ Al + 3NH_4\ (NO_3) = Al_2O_3 + 3N_2 + 6H_2O.$$

Ammonium nitrate decomposes on being heated to about 100° C., forming water and nitrous oxide gas (N_2O). At a somewhat higher temperature the reaction becomes violent owing to the large volume of gas evolved. The next stage is the spontaneous breaking up of the nitrous oxide into nitrogen and oxygen, which latter unites with the finely granulated aluminum to form aluminum oxide. The oxidation of aluminum evolves heat at the rate of more than three million calories per pound. Consequently once the process is started sufficient heat will be produced to decompose all the nitrate instantaneously, thus effecting a violent explosion. The only metals besides aluminum capable of this violently exothermic oxidation are calcium and magnesium, but both are, of course, commercially unpracticable.

Notwithstanding its high explosive properties this nitro-aluminum is a far safer material to handle than any of the nitro-glycerine or nitro-cellulose group, or the picric acid compounds. It can be fired only by a detonator and is thus ideal for high explosive shells as against time-fused projectiles. The gases produced on explosion are non-poisonous, being merely steam and nitrogen. Nitro-aluminum affords the munition chemist a cheap, safe and effective shell bursting charge.

In many other forms the light metal is finding new uses for war purposes. Bullet noses are being tipped with aluminum and sheets of the same metal enter largely into aeroplane construction.

ELECTRO-PLATING ENGINEERING

BEGINNING A SERIES OF ARTICLES RELATING TO THE OPERATIONS AND EQUIPMENT EMPLOYED IN ELECTRO-PLATING AND THE REASONS THEREFOR

BY C. B. WILLMORE

DRYING AND DRYERS

Drying is one of the operations in the plating room about which little has been said, but which nevertheless is highly important. Articles which are to be lacquered must be dried thoroughly, and where the finish is at all delicate the drying must be accomplished quickly to avoid staining. The method of treatment, of course, depends upon the shape of the article and what it is made of, to some extent; but the important determining factors are: the finish itself, whether of an easily stained or oxidized nature or not, and the subsequent treatment that is to be applied to it, whether it is to be lacquered directly or whether it is to be buffed or burnished after drying.

The first and simplest method is what might be termed "spontaneous" drying, which consists of dipping the articles, usually strung on racks or wires,

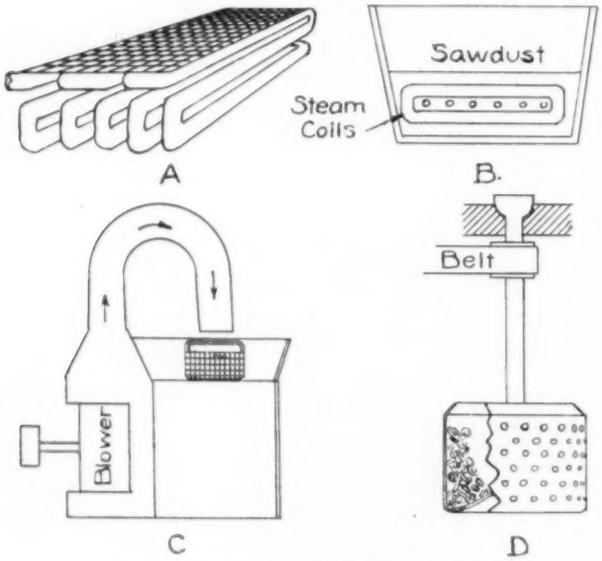


FIG. 1. SOME CONVENIENT DRYING DEVICES.

or in baskets, as taken from the plating tanks, into hot water until they are thoroughly heated, swinging them around to shake off the excess of water and then allowing them to stand in the air, depending upon the heat that has been stored up in the article itself to finish the drying. The articles which are treated in this way should be simple in design, having few crevices or depressions where the water might be apt to cling; and they should have enough weight so that they will hold sufficient heat to dry themselves. If the articles are not very heavy, or if they contain small holes or recesses, this drying operation should be supplemented by hanging the work in a drying chamber or over some steam pipes. This method cannot be used successfully on delicate finishes that are to be lacquered after drying, such as brush-brass, etc., because when water dries in the air on such finishes it invariably leaves a stain. The method may be applied to oxidized finishes that are to be scratch-brushed or relieved, and it is particularly applicable to nickel, which is to be buffed afterwards. After taking the nickeled articles from the tanks and rinsing in cold water, it is a good plan to dip them into a solution of whale oil soap, about ½ pound to a gallon of water, which puts a very thin film of grease on the surface, sufficient, however, after the work has been dipped into hot water, to cause the water to collect in beads so that it can be shaken off readily.

Hot air chambers are usually used to complete the drying operation after the excess of moisture has been removed by some rougher method such as the "spontaneous" drying already mentioned, or the centrifugal dryer to be described later. These drying ovens are usually built of sheet iron to a suitable size, having rods inside them on which to hang the racks of work, and heated by steam pipes placed preferably on the sides and near the bottom, but never at the top, which would give an extremely poor circulation of air. There should be a small inlet for air at the bottom and a small outlet at the top, for the air in the chamber slowly becomes saturated with moisture and dry air must be constantly admitted in small quantities to make up for this. It is uneconomical to hang work in here that has not had the excess of water removed by some other means, because the air would become saturated so quickly that it would be necessary to have it changing constantly at a rapid rate, which, of course, would waste heat. It must be remembered, too, that work with delicate finishes will stain just as much when hung in the oven as if dried in the open air.

An apparatus similar in nature to the drying oven, and used on the same class of work, but a little more wasteful of heat, is the steam table. This consists of coils of steam pipes arranged somewhat like figure 1-A. A wire screen rests on the top of these pipes and the work to be dried is simply placed on this screen. This apparatus has the advantage over the drying oven that the work does not need to be on racks, it can be simply dumped on in bulk as it comes from the plating barrel; and further, it dries more quickly because the work is out in the open air and a much better circulation occurs. It has, of course the same objections as to staining the work as the previous methods.

To prevent staining, the work, after being removed from the hot water, is usually thrown immediately into a box containing hot sawdust. The sawdust absorbs the moisture before it has time to stain the finish, and steam pipes are used for the purpose of keeping the sawdust as dry as possible. Figure 1-B shows the end view of an ordinary type of sawdust box, which may be of wood or galvanized iron, although wood holds the heat in better, with steam coil in the lower compartment and sawdust on the sheet iron partition above this. The sawdust chosen is preferably of some hardwood that contains no gum or resin to smear up the work, or tannic acid to stain it. Box-wood sawdust is said to be the best, and likewise is by far the most expensive, while maple is the most satisfactory of the cheaper grades. A few small holes should be bored in the side of the lower compartment to allow some circulation of air. In one case, after a sawdust box had been constructed and set in operation, it was found that although plenty of steam was circulating through the steam coil, yet the sawdust did not transmit enough heat to the sheet

iron partition above. After a few small holes had been bored in the lower part, the sawdust heated so rapidly that it was necessary to cut down on the steam supply. In handling small articles, after they have been dried by shifting them around in the sawdust, they are placed on a sieve and shaken to remove the sawdust. For the sake of the operator's health some sort of draft should be provided to carry away the cloud of fine dust that arises. The opening for this draft is better placed vertically above the back of the box or even slanting out, say, at an angle of 45 degrees over the box. A suitable cover should be made for the box to keep out dirt and dust when it is not in use.

Another drying method consists of blowing a rapid current of hot air on to the work, which is held in a wire basket, as shown in figure 1-C. The action of this stream of hot air is to carry away some of the water mechanically as well as to evaporate it. The

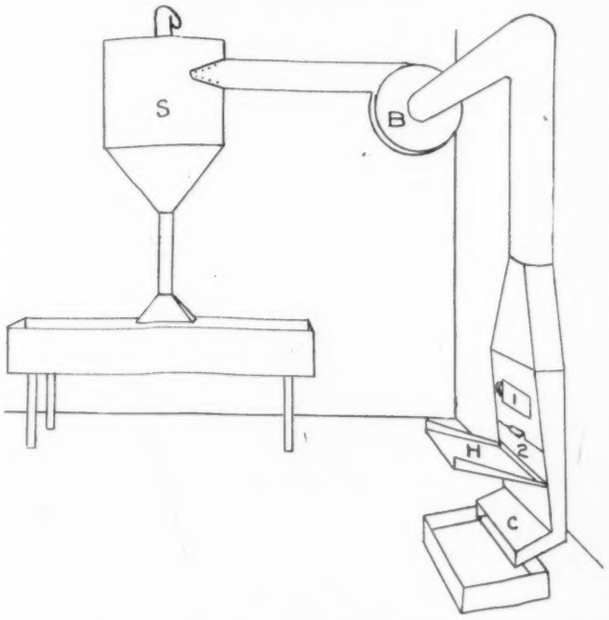


FIG. 2. AN EFFICIENT SAWDUST SEPARATING APPARATUS.

system is adapted to small work, such as keys, screws, etc., and to work well the basket should not be overloaded in order that the air may get through easily. This arrangement has been patented by F. P. Boland, and is manufactured by H. J. Astle & Company, Providence, R. I. As regards staining the work, it is somewhat better than drying in still air because some of the moisture is blown off the articles instead of evaporating on them; but it is perhaps not quite so good as the sawdust method, although more rapid.

In plants where compressed air is supplied to the plating room, this may be turned on the work, which is a rapid drying method, but is not so thorough as applying heated air, and should be used only on flat or plain rounded surfaces with no depressions which the air cannot get at.

CENTRIFUGAL DRYERS.

Centrifugal dryers are adapted to about the same class of work that is plated in plating barrels, small light articles in bulk, such as screws, thimbles, glove fasteners, etc. The principle consists of putting the wet articles into a perforated metal basket, as shown in figure 1-D, and then rotating the basket at such high speed that the water is thrown off at a tangent by centrifugal force. Heavy articles should not be put in centrifugals, because at the high speed at which this sort of apparatus is rotated the centrifugal force puts a very great strain on the sides of the rotating basket. The basket should not be filled more than half full for the reason that if the water has to travel through too thick a layer of the articles the drying operation is greatly hindered. Furthermore, since the magnitude of the centrifugal force acting upon an article varies directly as the distance of the article from the center of revolution, if the basket is filled up, part of the articles will be so close to the center of rotation that comparatively little force will act on them and they will still be moist when the ar-

FIG. 3. A VIEW OF CHUTE C AS SHOWN IN FIG. 2.

ticles near the sides are dry. Before starting the machine, it should be made sure that the articles in it are distributed rather evenly, as uneven loading will cause the centrifugal forces on different sides to be uneven also and there will be a tendency for the basket to gyrate when starting up, that is, for its axis to swing about in a circle, thus putting a considerable strain on the shaft. To save injury to the shaft from this cause, most of these machines are built with the shaft suspended from a ball and socket joint, the lower end being allowed some freedom of gyratory motion, as typified in figure 1-D. In starting up the machine, the lower part will usually gyrate a little at first; then as it comes up to speed, the tendency for rotation about the axis becomes greater than the tendency for gyratory motion and the apparatus settles down to smoother running. With both ends of the shaft fixed, there is no provision for this initial unsteadiness and the shaft is liable at some time or other to be subjected to severe strains.

There is no tendency for the articles to be jostled

about and scratched while the machine is in motion because the centrifugal force causes them to cling so firmly to the sides of the basket that there is no chance for motion among themselves. The only scratching that can occur is when the articles fly against the sides on starting the machine, or when they fall to the bottom of the basket on stopping, and in both cases, the motion is slight. With articles that have holes in them with only one end open, it is quite probable that some of them will be so placed that the open end points toward the center of motion and therefore the water cannot be thrown out by the centrifugal force. To overcome this difficulty the machine should be started and stopped several times, which will cause the articles to shift places so that those articles which were so placed at first as to hold the water will in all probability finally get into a position where the water will be forced out. If a simple centrifugal of this kind is used, it is a good plan to heat the articles in an oven afterwards to make sure of the drying.

A good combination is obtained by blowing a blast of hot air onto the work while it is being rotated in the centrifugal. Three drying actions result: the effect of centrifugal force on the moisture, the evaporation due to the heat of the air, and the "scrubbing" action of the air which, entering the inside of the basket at a fairly high rate of motion, is forced through between the articles at a much greater rate due to the effect of the centrifugal force. With such a combination the water is removed so rapidly that there is little time for it to stain the work. The H. J. Astle Company manufactures a simple combination of this kind and the Tolhurst Machine Works, Troy, N. Y., sells one which is excellent from a mechanical standpoint.

One scheme that was used very successfully to prevent the staining of brush-brass finish goods was to brush them on a tampico wheel using a paste of pumice stone and kerosene. The grease left on the article was then removed with gasoline and as an extra precaution against staining, they were dried in sawdust.

Figure 2 shows a very unique, and at the same time quite efficient sawdust separating system used in the plating and polishing department at the up-to-date plant of the Felt and Tarrant Manufacturing Company, Chicago, Ill., makers of the Comptometer. The exceedingly complex assortment of small parts composing the Comptometer, with great variety of size and form, coming through this department in enormous quantities makes the drying problem a formidable one. The small parts are first dipped in hot water in wire baskets, then they are put into a tumbling barrel with a quantity of sawdust and tumbled for two or three minutes. Ordinarily this mixture of small parts and sawdust would then be riddled on a sieve to get rid of the sawdust. In this case, however, it is impossible to follow such a procedure, because the parts contain so many projections and some of them are so delicate that if they were shaken on a sieve they would catch in the wires of the sieve and be bent out of shape, which would effectually ruin them, inasmuch as the extreme delicacy of the mechanism in the finished machine demands a high degree of accuracy in the fitting of its parts. The apparatus shown, which is the design of O. E. Servis, in charge of the plating and polishing department, has been found fully equal to the problem of handling large quantities of these parts without injury. The mixture of sawdust and metal parts is shovelled carefully onto the inclined table H in Figure 2, which feeds it in an even layer into the chute C. Here it meets with a rapidly moving current of air from the fan B, which carries the sawdust away while the metal parts themselves drop into a box below the mouth of the chute, practically free from sawdust, and as the distance they travel is short, they are uninjured. The chute is narrowed where the work feeds into it, in order to cause the air to move more rapidly at this point. Control of this blast of air is effected by the slide marked 1 in the front of the flue. When the articles are so small and light that there is danger of their being carried away with the sawdust, the strength of the blast is broken somewhat by opening this slide. Vertical slide, 2, permits of adjusting the rate of feed into the chute by changing the size of the opening.

The mixture of air and sawdust after passing through the fan runs into the separator S, the function of which is to provide a large space where the velocity of the air is cut down to such a degree that it will no longer hold up the sawdust, which drops to the bottom of the separator and down through a pipe to the bin shown below it, and can be used over again. There is also some centrifugal action in the separator, as the air when it comes in tends to whirl around so that the sawdust is thrown out to the sides of the drum. The air, after dropping most of the sawdust, passes out through a pipe in the center of the drum at the top, carrying with it some of the undesirable fine dust. Besides being separated from the metal parts, the sawdust is also partially dried out by the air. Fig. 3 is a photograph of the chute C with part of the flue above it.

(To be continued)

ANTIMONY MINES IN HONDURAS.

[Consul Walter F. Boyle, Puerto Cortes.]

Because of the advance in value of antimony incidental to the war in Europe, the profitable exportation of antimony ore or stibnite assaying about 70 per cent has become possible from a mine said to be rich, but hitherto undeveloped, because of unfavorable transportation conditions, and recently several small shipments of ore have been made from this port to New York. This ore is mined in the vicinity of the interior village of Voro and has to be transported six days by pack mule to the Sulaco River, thence two days by canoe down the river to Pimienta, where rail connection is made for Puerto Cortes. The mining and shipping of this ore under such difficult transportation conditions is along the line with the claim that has often been made—that the interior of this district was rich in minerals and only needed railroads for the development of the same.—Commerce Report.

The name of the mine owner may be had from the Bureau of Foreign and Domestic Commerce or one of its branch offices. Refer to file No. 69,907.

CORRECTION

In the article "Collapsible Aluminum Cup" in the December, 1915, issue of THE METAL INDUSTRY the captions under the cuts on pages 491 and 492 were inadvertently transposed and should have been as follows: Fig. 12 should be Fig. 11, Tools for Swedging Operations Shown at D. in Fig. 2. Fig. 10 should read Fig. 11, Tools for Rolling Bead as Shown in Fig. 3. Fig. 13 should read Fig. 12, Tools for Cutting Cup in Four Sections as Shown in Fig. 4. Fig. 11 should read Fig. 13, Tools for Rolling Bead as Shown in Fig. 6. Fig. 14 should read Drawing Small Shell from Scrap Blank from Bottom Ring.

THE ALUMINUM INDUSTRY

A Brief Resumé as to Conditions in the Trade.

By Aluminum Man.

The aluminum market in 1915 like the market for all other metals went through a series of very radical changes. The domestic overproduction of aluminum which had existed in 1914, and for a number of years previous, still continued during the first few months of the year. Importations from Germany ceased almost from the beginning of the war, but aluminum from France and England could easily be had until well into the year. Notwithstanding the fact that a general proclamation prohibited the exportation of all articles capable of being used for war munitions, the French and English manufacturers had no difficulty in getting permission to make shipment to this country on stating the use to which the aluminum would be put and guaranteeing that it would not reach the enemies of the Allies. This condition changed however as the year wore on, due not so much to increased restrictions on exportations from Europe as to increased demand on the part of the foreign Governments for aluminum for war purposes. At the same time, as all will remember, business gradually quickened in the United States so that by mid-summer aluminum was not easy to get and its price gradually increased so that at the end of the year the price quoted by the domestic manufacturer was 31 cents per pound.

A number of trade papers have erroneously been quoting the price of aluminum at even as high as 55* cents per pound. While it is true that sales have been made at considerably higher than 31 cents, and even as high as 55 cents, this anomaly has arisen from the fact that the only American producer has refused to sell its aluminum for war purposes, but has steadfastly and consistently adhered to its policy of supplying to its old customers in the United States their needed supplies for their regular line of business. There has in consequence been during the last three months two markets, as it were. A primary market, as it might be called, between the American manufacturer and the American consumer, and a secondary market between the foreign War Offices and such parties in the United States as have either re-sold their material obtained from the American manufacturer or, as has been true in the greater number of cases, have obtained scrap aluminum to supply this foreign demand. The primary market, as stated, rose from 20 cents at the beginning of the year to 31 cents at the end of the year, while this secondary market has of late been running as high as 55 cents per pound.

An announcement during the year of interest to the trade was that in the late summer the Aluminum Company of America were negotiating for the acquisition of the lands and properties in North Carolina formerly owned by the Southern Aluminum Company which, on account of the war, has been obliged to abandon its financial scheme for the completion of these works. These negotiations were brought finally to a conclusion though it was not until December that the transfer was eventually made. We understand that the Aluminum Company of America has thrown a large force of men into the field and are pushing the completion of these works forward at break-neck speed. Mr. Davis, President of the Aluminum Company of America, in an address before the Automobile Engineers in Detroit stated that his company expected to complete its new works in 1916 and, although he did not say so at the time, he no doubt had in mind the completion of these works thus acquired in North Carolina. Mr. Davis in this same address further stated that his company were, notwithstanding the acquisition of this North Carolina property, proceeding just the same to coplete its very large development on which it has been working for some time, from which it is expected that there will each year, as its successive stages are completed, be supplied to the industry substantial and increasing quantities of aluminum. Mr. Davis stated in that address that so far as he could see the plans of the Aluminum Company of America were such that the days of shortage of aluminum were over at least for years to come.

Another development of interest is the building of the large rolling mill and stamping plant which the Aluminum Company of America is erecting on the Hudson River in Edgewater, just opposite Grant's Tomb. The buildings as seen from the New York side already show the large scope of this enterprise which will, when completed, be the largest mill of this kind owned by the Aluminum Company of America and, in fact, will be the largest of its kind in the world.

[*Inasmuch as the American producer has for some time had no aluminum to sell in the open market at the 31-cent price has been practically nominal and therefore trade papers have quoted the actual prices ruling for the metal, viz.: from 55 to 65 cents according to quantity.—Ed.]

SOME NEW ALUMINUM ALLOYS.*

"Ormiston Metal" is said to contain 97.5 per cent aluminum, but no further information of its composition is given. Extravagant claims are made as to its physical properties.

"Albidur," manufactured by Otto Grison and Co., Magdeburg-Buckau, is of white color and is furnished in two qualities, soft and hard. The specific gravity of the soft is 2.9, the hard 3.0. The tensile strength of the softer alloy is about 18 kg. per sq. mm. (25,500 lb. per sq. in), elongation 5 per cent; harder alloy, 20 to 24 kg. (28,000 to 34,000 lb.), with 1 to 2 per cent elongation.

"Weidrium," manufactured by Richard Weidener, Leipzig, Sellerhausen, has specific gravity between 2.75 and 3.1, tensile strength between 14 and 20 kg. (20,000 and 30,000 lb.), with 4 to 12 zinc or tin, and at times also magnesium or iron.

"Antherium," manufactured by Prett, Bowlie and Co., London, has specific gravity 2.4 to 2.57, tensile strength 29 kg. (42,000 lb.), elongation, 17.5 per cent.

"Electrometall," manufactured by the Chemische Fabrik Griesheim-Electron, is an aluminum-magnesium alloy with specific gravity 1.8. It is evidently magnesium stiffened by a small percentage of aluminum.

Miscellaneous.—W. A. McAdam patents the following new alloys:

(1) Aluminum ..... 100 Copper ..... 18 Zinc ..... 5 Antimony 3	This is said to be very strong and suitable for castings.
(2) Aluminum ..... 100 Silver ..... 20 Zinc ..... 10 Copper 5	This is said to be strong casting alloy, particularly useful for surgical instruments.
(3) Aluminum ..... 100 Cadmium ..... 30 Tin 5	This is said to be soft alloy which can be easily rolled into foil.

*J. W. Richards in advance chapter of "Mineral Industry," 1916.

PHENOMENAL GROWTH OF A BRASS MANUFACTURING COMPANY

A Brief Description of the Development of the Crane Company, Chicago, Ill.

On July 4, 1915, the Crane Company of Chicago, Ill., celebrated the sixtieth anniversary of the founding of the business of R. T. Crane, who in 1855 poured molten brass from a small hand ladle into a molding flask in the little shop in one corner of a lumber yard at Canal and Fulton streets, Chicago, Ill. This little building which, at that time, represented a most modest attempt at brass founding is shown in the photograph.

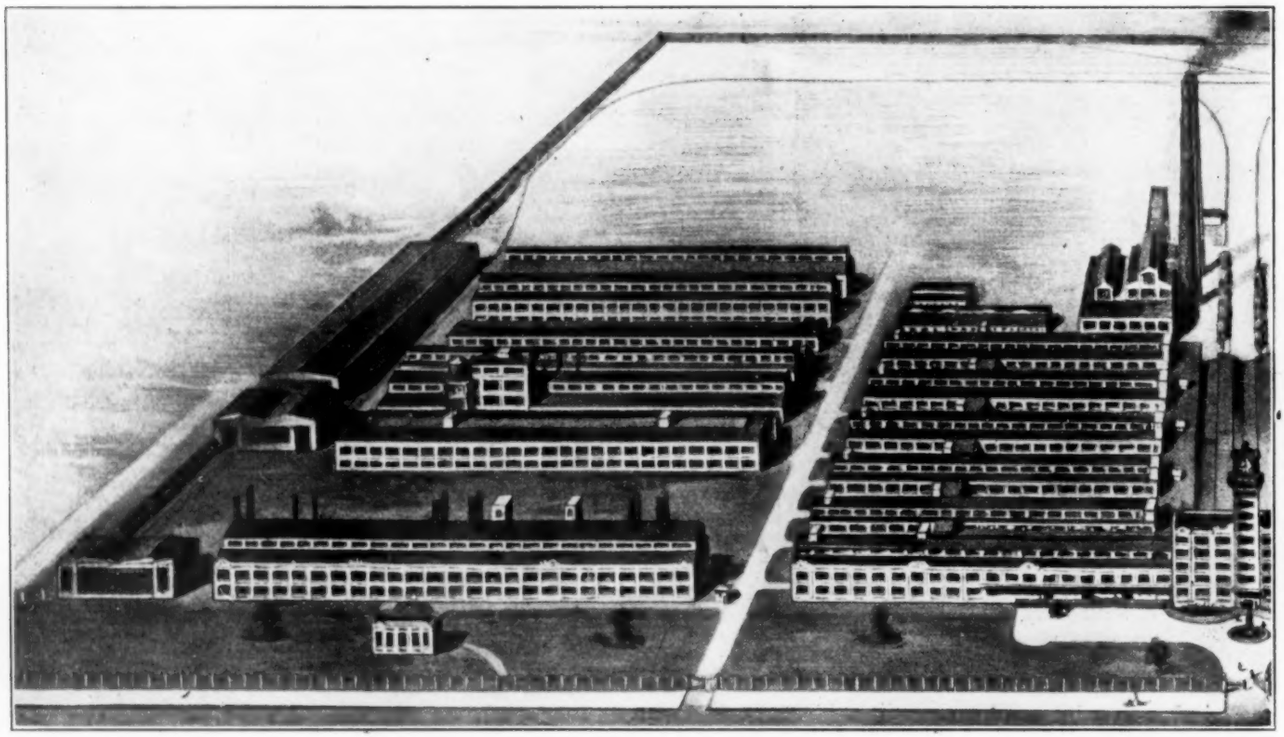
On October 15, 1913, ground was broken for the new Corwith Works of the Crane Company, which are shown below in the panoramic view. The following are some of the most important facts relating to this enormous installation:

Location, Kedzie avenue, between Thirty-ninth and Forty-third streets, extending west to Central Park avenue.

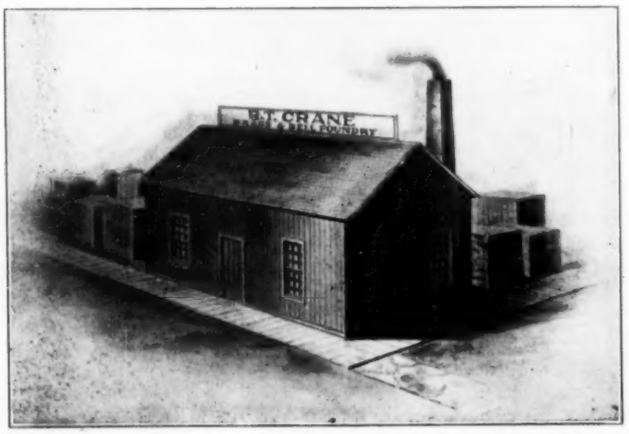
Amount of ground, 160 acres. Number of buildings, forty-nine. Floor space, approximately fifty acres. Construction, steel and reinforced concrete, strictly fireproof. Size of typical building, 80 by 500 feet, two stories high, forty feet court between buildings. Building line, 150 feet from street, intervening space to be used for attractive parkway; buildings numbered and lettered for identification. General shipping facilities, five railroads and drainage canal. Local shipping facilities, seven miles of switch track on premises.

Ground broken, October 15, 1913.

Cost of works complete, estimated $10,000,000. Other features: A forced circulation of hot water heating; diameter of clock dial, 15 feet; twenty-nine electric elevators of latest design; electric synchronized clock system; electric monorail crane for handling coal; underground tunnel for all service piping; locker rooms; most modern toilet facilities, including drinking fountains, shower baths, sinks, lavatories, closets, urinals, etc. Machinery equipment, etc., of the most modern and the best design.



THE GIGANTIC NEW WORKS OF THE CRANE COMPANY.



THE ORIGINAL BRASS FOUNDRY OF R. T. CRANE, STARTED JULY 4, 1855.

Between the shop of 1855 and the great works of 1915 practically every decade has seen noteworthy additions to the company's physical possessions, or changes in keeping with its rapidly increasing business. In 1855, brass couplings for lightning rods and copper lightning rod tips filled the first orders, and the company's first catalogue was no bigger than a post card. In 1915, with its manufacturing activities confined exclusively to the valve and fittings business, more than sixteen thousand articles are manufactured, and the catalogue for this part of the business alone is a compactly printed book of more than six hundred pages.

THE EFFECT OF THE WAR ON LACQUERS

A Brief Article Treating of the Scarcity of Raw Materials and Price of Production.

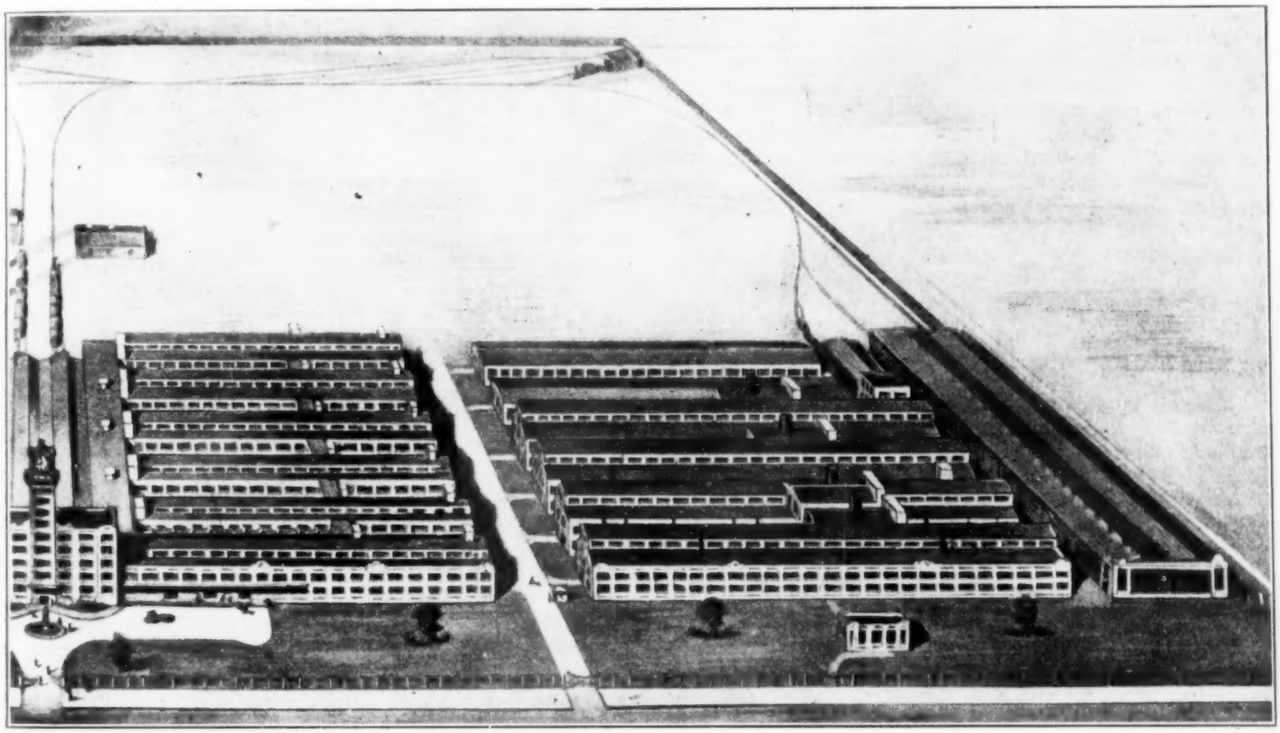
By William App Jones.*

So many different materials have been advanced in price by the war, or have been cut off entirely, that it is looked upon as something to be expected. The prices of zinc, copper, etc., have advanced abnormally and the metal manufacturer has naturally complained, but by paying the bill has been able to get material, even if delivery was delayed somewhat.

The effect of the war on the raw materials for making lacquer is worth the consideration of all the metal manufacturers using lacquers. Already prices have been very considerably advanced, but the user has been able by paying the bill to get his regular quality of lacquer and with little or no delay. So far as my own company is concerned, the trade has derived the benefit of large supplies of crude material that were on hand when the war started or were obtained soon after. While prices have advanced, such advances have by no means represented the advance in the cost of raw materials. So far as I can judge all of the manufacturers of lacquers have given their customers the benefit of the raw materials they had on hand, and there has been no attempt to "squeeze" any one, either as to price or delivery. Naturally, after a while raw materials become exhausted and it is advisable to consider the possibility of getting further supplies and the cost of such supplies.

The United States uses under normal conditions approximately one million gallons of fusel oil per year. Of this amount fully seventy-five per cent comes from abroad. The remainder is produced in the United States. The supplies have come principally from Russia, Austria and England. Germany formerly exported much fusel oil, but within the past few years they have consumed as much as they have produced. Sweden and Italy have produced relatively small amounts and Spain an exceedingly small amount. France has produced a certain amount, but at times the French government have used practically all of it for manufacturing powder. Immediately when the war began Great Britain prohibited the exportation of fusel oil. There were considerable supplies in Russia, but it was difficult to get it out.

In spite of all difficulties, American enterprise succeeded in getting a considerable quantity of oil out of Russia, and this oil has been of great help. Quite recently the Russian government has prohibited the exportation of fusel oil, except that it be consigned to the Department of Commerce, and has put on other restrictions. This practically amounts to prohibiting the exportation of oil from Russia, and so far as I know there is now little likelihood of further supplies coming from Russia.



AT CHICAGO, ILL., NOW BEING OPERATED AT 50 PER CENT. OF ITS CAPACITY.

Of the million gallons of oil used in America, three hundred thousand gallons would undoubtedly be a liberal estimate of the oil produced in America. Due to the abnormal rise in the value of fusel oil, every distillery will naturally save every bit of oil they possibly can. Assume that due to the abnormal prices, America will produce in the next twelve months a half million gallons of fusel oil. This figure is undoubtedly excessive. Even so, it represents not more than half of the amount we have been using for some years.

As to the effect on prices—crude fusel oil was worth

*Celluloid Zapon Lacquer Company, New York.

† Amyl acetate is made by treating Fusel Oil with acetate of lime and vitriol.

at the beginning of the war about $1.25 per gallon. It is worth today $3.40 per gallon and is constantly advancing. Even if the price of the oil was advanced to much higher figures, I do not see how it would be possible for the United States to produce more than a half million gallons.

You will see from the foregoing that the problem we are facing today is not only one of price, but the main problem is to make half a million gallons do the work of one million gallons. It is not my purpose to frighten anyone or to create an idea that there is going to be a lacquer famine. I do mean to say, however, that some of the fusel oil that has been used must be replaced with something else. We have before now encountered conditions that seemed most discouraging and yet somehow a way out of the difficulty has been found. There can be no getting around the fact that some of the people who have been using fusel oil in some form will either quit doing that business or use something else or use a smaller proportion.

The uncertain changes in the cost of fusel oil, and therefore of lacquers, has been a problem for some years, and gradually certain lines that formerly used the material have found a way of using less or of cutting it out entirely. When the first kodak films were made, a cotton solution containing a large amount of amyl acetate was employed. It would have been impossible for this business to have grown if it had been necessary to use amyl acetate. Through a careful study of the problem, it was found that if these films were made in a dry atmosphere that wood alcohol could be used as a solvent instead of amyl acetate or fusel oil. Undoubtedly the world's production of fusel oil for a year would not make more than a few days' supply of the many miles of moving picture film that are being turned out daily.

Also, when the first artificial leather was made, amyl acetate made from fusel oil was the principal solvent. This material is a fabric coated with a mixture of soluble cotton and other ingredients. The world's production of fusel oil for a year would not run the American factories making artificial leather more than two months. As the price of fusel oil advanced the makers of artificial leather adapted their processes and machinery to the use of other solvents. It was not possible for them to drop fusel oil all at once, but gradually it was replaced with other solvents, until now an exceedingly small amount is used by the industry. In mentioning the above instances I have in mind to show that the lack of no one material stops business. Certainly people are not going to stop making polished metal. They will find some kind of lacquer that can be used or else they will sell their polished work without that. In the past five years a great education has been going on in the larger lacquer rooms all over the country. Technical journals, such as THE METAL INDUSTRY have contributed largely to this general education. The Electro-platers' Society has done much along this line. The manufacturers of lacquer have contributed their part in everlastingly preaching care in the cleaning of metals and in the applying and drying of the lacquer. Only a few years ago most any of our large customers who might find their lacquer turn white on a damp day in summer would inform us that our lacquer was "no good." The reason of this was because they did not understand why the lacquer turned white. I doubt if there are many left now who do not know that the turning white is due probably to the absorption of water and they know how to correct it, or else they ask us for help, but without saying that the lacquer is "no good." As prices have gone up, we have introduced into quite a few of the best run shops cheaper priced lacquers that will give just as good a finish to the metal as any, provided care is used in applying them. This has meant a big saving to the users of these lacquers and their results have been in every way satisfactory.

It seems to me that the users of lacquer should co-operate with the lacquer makers towards using lacquers that contain the least possible amount of fusel oil and amyl acetate, that are required for their work. It is certainly much cheaper to put in proper drying ovens and to regulate the temperature and moisture of the room than it is to pay a dollar per gallon more for lacquer and be able to work by an open window in damp weather. Other lines of business have encountered this problem and they have worked it out successfully. If at the present time a manufacturer is using a lacquer containing say 75% of fusel oil, probably he can equip so as to use a lacquer containing 40%. He will not only get the benefit of it now but he will in future. If he does not work along this line, he will unquestionably in the near future pay an enormous price for lacquer.

As to enlarging the production of fusel oil or producing it by synthetic methods, there is little to be hoped for in the immediate future. Being a waste product, from the manufacture of pure grain alcohol, its increased production would depend upon an increased production of pure grain alcohol. There have been one or two synthetic processes mentioned in the past year or two, but nothing has come of them. One method was involved in the synthetic production of rubber and has never become a commercial success. The most likely method of increasing the production would be by the discovery of bacteria that would convert sugar into fusel oil instead of into grain alcohol. It has been stated within two years that such bacteria have been discovered in France, but apart from the bare announcement, no progress has been made.

No immediate help can be expected from new or improved methods of making fusel oil. Our present problem is to make existing supplies go as far as possible, and in writing the above, it has been my hope that I might be able to help somewhat towards having the users of lacquers and the makers of lacquers co-operate with this in view.

DISCOVERY OF PLATINUM IN SPAIN.

[Consul Robertson Honey, Madrid, November 4.]

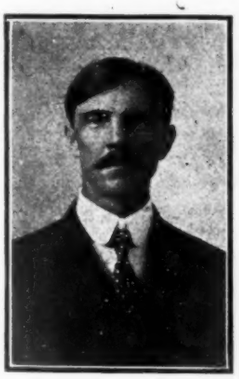
The recently published rumor that platinum has been discovered in Spain was confirmed this week by Prof. Orueta in person. The latter is a Spanish mining engineer and was designated by the Instituto Geológico (Geological Society) to examine the Ronda Mountain Range for possible mineral deposits. He has made an address before the Instituto de Ingenieros de España (Society of Civil Engineers of Spain) in Madrid, in which he sets forth his labors and their results. He states that he has discovered platinum deposits of greater extent and richness than those of the Ural Mountains in Russia, which furnish about 90 per cent of the world's supply. The present market value of platinum is about $46.25 per ounce.

As is known, Spain possesses the largest and richest mercury mines in the world; these are under lease to a British company, which exploits them.

FURNACES AND TEMPERATURES

SOME RANDOM OBSERVATIONS ALONG MELTING LINES.

BY H. D. COLEMAN.*



H. D. COLEMAN.

Today where every thought is given over to efficiency, which needs must include low cost fuel and convenience of manipulation, the best type of melting furnace can only be determined after certain tests are made and tabulated, extending over a considerable period of time.

With refractory alloys it is essential that the furnace be able to show a quick, high temperature. It is generally conceded that best results are secured by melting quickly, both for the benefit of the metal under fire treatment, and for the proprietor's pocketbook. Few if any alloys improve by soaking, after they are ready to pour; they should be cast promptly and a new charge be given the benefit of this added heat.

Where non-precious metals are being melted, the question of ash removal and subsequent treatment may not enter largely into the problem, but where values that escape mechanically to the ash pit must be recovered and promptly, the coke or coal furnace smacks of bygone days, and progressive metallurgists see greater benefits to be derived from combustion, as secured from liquid or gaseous fuel, or by the use of the electric current.

It is a well-known fact that where crucibles are lifted from coal and coke furnaces for pouring purposes, the bed of incandescent carbon about crucibles must be disturbed by "poking" to make the "draw-out" easy. Here we suffer a dual trouble: First, by deranging our fire for the succeeding heat, and again, by subjecting the crucible to the more or less damaging influence of tongs, and bad effects of the chilling atmosphere, a severe tendency to fail is put upon the pot, with consequent lessening of the life thereafter. Crucibles are frail things at best, though at times where good materials have entered into their makeup, and proper attention given to rightly annealing them, it is truly remarkable how well they do hold together. Still another cause of crucible failure is due to oxidizing flames, which have the effect of taking from the body of the crucible its chief ingredient, carbon, leaving a framework of porous clay that soon must fail.

It seems to be a difficult matter to recognize and prevent an oxidizing flame from playing around a crucible. In any case the flame or blast should not strike the crucible, as such a scouring effect will soon bring collapse. The difficulties attending the "lift out" method of casting ingots or bars, including the risk the melters run in having a pot of molten metal "let go," and spreading over everything a sheet of flaming fluid is ever present, but must be endured.

Where but few bars are to be cast, or where the entire contents of the crucible is discharged at one pouring, there is no better way to handle this difficulty. In fact, most rolling mills seem to figure it out as the best practice; to lift out the crucible and pour. Where a number of bars are cast (I don't refer to foundry work) from the same pot of metal, a dipping process, two men using individual cups, makes for clean and rapid work. This method is successfully carried out even where the ingot will weigh more than a single dipper of metal, if No. 2 melter is careful to start his pour before No. 1 melter finishes. Here the advocate of the tilting furnace comes upon the scene, and demonstrates in glowing terms how easy it is to pour direct. Yes, it is easy to pour direct, so is it easy to hit the side of a house with a charge of gunshot from a reasonable distance; but let me put a bull's-eye there to be hit, in the shape of a rather small mouth mold, after which please note the amount of metal poured that fails to hit the spot. I have tried it, brother, tried it a number of times, and have concluded that it is feasible in regular practice only when an interposing receptacle is used as an overflow basin. Here we encounter other difficulties, for if very refractory metal is being worked, best results are had by reducing chilling tendencies to a minimum.

Where many bars are made for rolling, it seems that the usual method in vogue for tying the two-piece iron molds in place is truly crude. Generally the ring and wedge method is used, and possibly on account of the comparatively short life of these chills it is thought not worth while to devise a quicker and less laborious way of clamping and unclamping. There seems to be a field here of promise for development.

The question of "speed of melting" is a variable one, depending upon character of fuel, efficiency of furnace, care and knowledge on the part of the melter, and the degree of refractoriness of metals used. Of the ordinary alloys, cupro-nickel gives most trouble in making sound malleable bars. In the case of this allow where the nickel contents is around 25 per cent., I believe most of the trouble encountered is due to lack of sufficient heat. Then in remelting scrap, even though it be free from impurities, the greater surface offers ample opportunity for the formation of oxides. To anticipate these possible sources of trouble and in a measure reduce their occurrence, I would advise keeping the metal well covered with charcoal, and firing up quickly and get all metal in pot and lid in place as soon as possible. In cupro-nickel melting, if troubled with oxides, it is soon made manifest by the "wildness" of the heat (spitting out lively—not at all quiet) and by the decidedly convex head on the bar. After pouring this first bar and it is noticed that the occluded gas has forced the convex head, a deoxidizing metal should at once be introduced, preferably silicon copper. Manganese may also be used, likewise other metals that have strong affinity for oxygen, but with manganese the action is not so prompt, and a more mobile fluid results, which seems to encourage the flux and carbon to follow into the mold, and become lodged in the bar.

With a cupro-nickel alloy of 75 per cent. copper and 25 per cent nickel the temperature at casting, from bar copper and cube-nickel should be no less than 1310°C—I dare say many heats are poured at lower temperatures than this, but better results in the rolling would be had if tendencies were on the high side. The appearance of the surface of the metal when this casting moment has been reached is the yellowish white verging on the well-known white welding heat. This glassy sheen on the surface from where the charcoal cover has been brushed aside by the end of the

*Superintendent Melting and Refining, United States Mint, Philadelphia, Pa.

poker, is positive evidence to the trained eye that the correct temperature for casting has been reached. Of course this gradation of color is modified more or less, according to the exposure to sunlight, but experienced melters should know this and judge of their heat with this fact before them. The limit of correctness of temperature for casting, may be sufficiently wide to depend upon the unaided experienced eye, to produce good malleable bars; but a practical pyrometric equipment of instruments sufficiently robust to withstand high temperatures and not gentle treatment on the part of the melters, should prove a valuable acquisition to melting establishments preparing bars of refractory metals for rolling.

The melting periods in a good gas furnace, using the equivalent of a No. 100 crucible, should run about like this: Gold melts 6,500 ounces, 1.59 hours per melt; silver melts 4,000 ounces, 1.25 hours per melt; bronze, 95 per cent. copper melts 300 pounds, 1.56 hours per melt; cupro-nickel, 75 per cent. copper, 25 per cent. nickel, 300 pounds, 2.2 hours per melt, upon an eight hour basis. A longer run will, of course, cut down these figures, for the time, from a cold furnace may then be more widely distributed.

Uniform melting periods upon the same metal are difficult to secure throughout the plant. The causes may be traced to different sources, but usually a local trouble in a particular furnace accounts for its tardiness. The condition of the furnace cylinder, clogged orifices due to fluxing so as to interfere with the proper flow of the gas, all will contribute towards slowing down the speed of a furnace. Sometimes the flue connection leaks cold air, thus bringing about a back draught. This back pressure in certain furnaces may be advantageous in retarding the flow of hot gases up the stack and away from around the crucible. In fact, this may prove a valuable damper to be used to regulate heats. Then again a poor furnace attendant will cause his furnace to lag much behind one in the hands of a careful and attentive operator. There are many little knacks in getting the material to melt down quickly; I refer to charges that are too bulky to get in the pot at a single charge. It is interesting to watch a good melter playing for advantage, how he pre-heats, and takes every opportunity to keep every available cubic inch of his crucible space filled with metal; until full charge is put in pot. It is some advantage to leave a small pool of metal in pot to assist new charge to quicker melting. In preparing standard silver metal (900 silver, 100 copper, and alloys of silver and copper of about this purity, if pure metals are used, there should be no need of the addition of deoxidizers in order to produce a homogeneous and malleable bar, if the temperature has not been run up too high. A pouring temperature on standard silver of about 925° C. will be found good, and a decided scum will be noted at this time.

Upon standard gold the temperature will range around 1025° C., while with pure or near pure gold the temperature should go up to 1070° C. to be quite fluid and pour freely. If it is desired to pour fine gold in an open mold, a much clearer and cleaner surface may be obtained, by dusting sal ammoniac over the face of bar just before freezing starts. By promptly covering mold after pouring, thus excluding the air from the face of bar a better looking face will result. Pronounced pin holes in silver bars are due to too high temperature, cool down metal when troubles of this nature show up. If the truth be told, the solution of many a problem dealing with the working of metals, is to be found in pouring it at the proper temperature.

BAUXITE.

Some Interesting Information Relating to the Source of Aluminum

By C. H. Gordon.*

The metal aluminum occurs in many different minerals, but from very few has its extraction up to the present been found practicable. Of these, bauxite, a hydrate of alumina, is the chief source of the metal. The composition of bauxite when pure is $Al_2O_3.2H_2O$, or Al_2O_3 73.9 per cent and water 26.1 per cent. The name "gibbsite" is applied to the crystalline variety having a higher content of water ($Al_2O_3.3H_2O$). The proportion of the metal aluminum in the above minerals is 39.13 per cent and 34.6 per cent respectively. Alumina occurs in the anhydrous form practically pure in the mineral corundum, but this substance is too valuable and occurs in insufficient quantity to be available as an ore of aluminum.

Prior to the discovery of bauxite, cryolite ($AlF_3.3NaF$), found in quantity in Greenland only, was the chief source of the metal.

As a mineral the alumina (Al_2O_3) in the ore may run as high as 70 per cent or as low as 40 per cent. Other substances usually present are silica, iron oxide, and the oxide of titanium. The ore in a deposit always shows considerable variation in composition.

ANALYSES OF BAUXITE

No.	Al_2O_3	Fe_2O_3	SiO_2	TiO_2	$CaCO_3$	H_2O	Moisture
1	30.30	34.90	.....	.....	12.70	22.10	.....
2	55.40	24.80	4.80	3.20	0.20	11.60	....
3	69.30	(*a*) 22.90	0.30	3.40	.....	14.10	....
4	76.90	0.10	2.20	4.00	.....	15.80	....
5	61.89	1.96	6.01	.....	.....	27.82	....
6	63.16	23.55	4.15	.....	.....	8.34	....
7	62.05	1.66	2.00	.....	.....	30.31	3.50
8	87.30	1.43	6.40	3.99	.....	0.88	....
9	62.46	0.81	4.72	0.23	.....	31.03	....
10	57.58	0.96	9.38	2.76	.....	29.12	0.35
11	39.92	16.84	20.00	1.47	.....	19.52	1.25
12	61.00	2.20	2.10	.....	.....	31.58	3.12
13	49.90	4.13	(*b*) 18.38	.....	.....	27.59	....

(*a*) Includes both FeO and Fe_2O_3. (*b*) Insoluble.

1. Hard, compact, red bauxite, Baux, France. 2. d'Allauch, near Marseille, France. 3. Red bauxite from Theronet, Var, France. 4. White bauxite from Villeveyrac, Hérault, France. 5. Glenravel, Ireland. 6. Vochein, Germany (includes 0.79 per cent. of alkalies (Na_2O, K_2O). 7. Arkansas. 8. Washed calcined bauxite from Arkansas. 9, 10, 11. Wilkinson County, Georgia. 12. Rock Run, Alabama. 13. Keenburg, Tennessee.

Bauxite exhibits a variety of textures, the most common being a pisolitic or oolitic ore consisting of rounded, concretionary grains ranging in size from that of a pea up to 1 inch in diameter, inclosed in a matrix of amorphous or clay-like ore. Another type found in certain deposits is the "granitic," which preserves in varying degree the granitic texture of the syenite from which the ore is derived.

The color of the ore varies greatly also, grading from light buff or white through gray to yellow, brown, or red, depending on the content of ferric iron. In hardness the ore may vary from that of a limestone to soft clay-like material that can be shoveled without picking. The upper portions of a deposit are usually harder as a result of the process of induration or cementing.

Bauxite melts at 1,820° C. and bauxite clay at 1,795° C. Bricks made from the unrefined bauxite ore melt at 1,740° C.

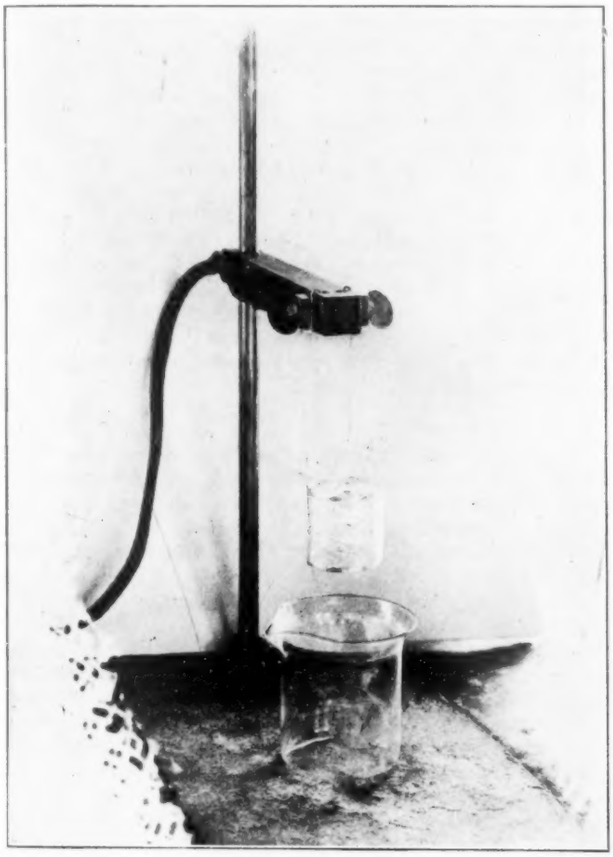
*From advance chapter of "Mineral Industry," 1916.

NON-CORROSIVE BINDING POST

A Description of A New Device for the Chemical Laboratory

By H. T. Leavenworth.*

The electrolytic determination of metals is now quite generally used in every metallurgical laboratory because of the satisfactory results obtained. Every chemist has been annoyed, however, by corrosion at the binding post, due to the slight spray of acid which even though the solution is covered seems bound to escape. This is perhaps more especially true where determinations are made with stationary electrodes and higher amperage and shorter time consumed; than when a longer period is resorted to, using a lower

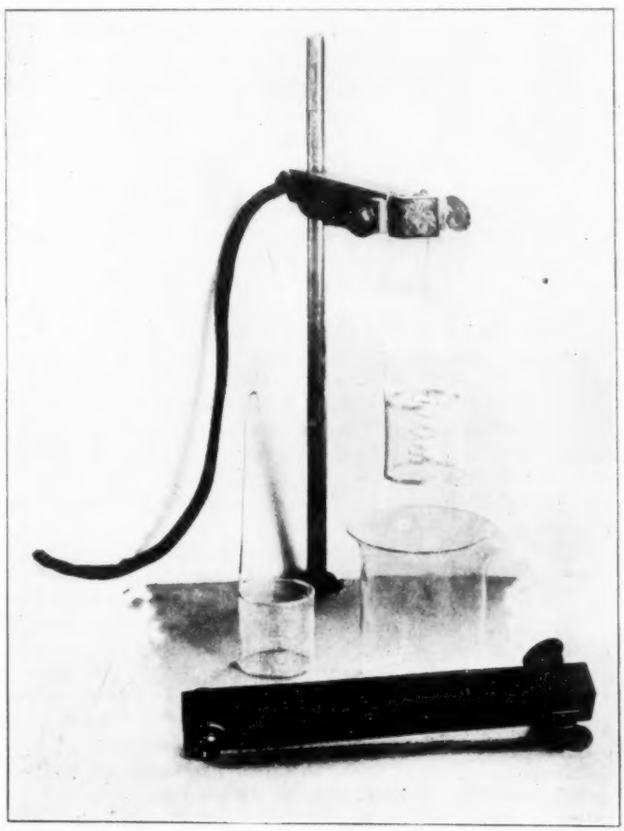


NON-CORROSIVE BINDING POST.

current. However, the corrosion appears eventually, especially with the stationary electrodes, and seriously interferes with the passage of the current.

The device shown in the illustration and designed and used by the Bridgeport Testing Laboratory, Industrial Chemists, appears to entirely overcome the trouble from corrosion. The laboratory does not claim any new idea in connection with the device and it is illustrated here because it can be easily constructed by any chemist, is inexpensive and will give greater satisfaction than any of the binding posts where the electrodes are held in place by a set screw and the contact made by the same means. The merit of this binding post is that the contact is made entirely separate from the binding screw, which is used solely to hold the electrodes.

The supporting arm which holds the electrodes is made from lignum-vitae but might be equally satisfactory if made from hard rubber or Bakelite or other similar substance. The arm is 5/8 of an inch square and 6 inches long. On one end it has a hole 3/8 of an inch in diameter and a slot with a set screw by means of which the arm can be moved up and down on the support. At the other end on each side are fastened brass supports with set screws for holding the electrodes in their proper places. Two small holes about 5/16 of an inch in diameter contain glass tubes closed at one end through each of which have been fused the short end of platinum wire. The diameter of this wire is the same as the wire stem on the electrodes. The other end of each platinum wire is soldered to the copper leads from the switch. These wires are on the under side of the arm and do not show clearly in the illustration, but are held close to the arm so as not to interfere with the subsequent handling. It was thought advisable to have these platinum wires leading from the tubes or cups long enough to reach



A BETTER VIEW OF THE NON-CORROSIVE BINDING POST.

beyond the outer edge of the electrolytic beaker, which in this case was two inches for each wire.

The glass tubes or cups hold mercury and by bending over the stem of the cathode and anode slightly, as shown in illustration, they dip into the mercury giving a connection with which the acid spray cannot interfere or corrode. The only precaution necessary in the use of the mercury cups is in filling. During the deposition the mercury gets warm and may expand to such an extent as to be easily jarred out of the cup onto the deposited metal while removing it.

*Bridgeport Testing Laboratory, Bridgeport, Conn.

BRINGING A JEWELRY FACTORY UP TO DATE

SOME SUGGESTIONS ACTUALLY GIVEN FOR THE REORGANIZATION OF A NEW YORK SHOP.

BY C. M. HOKE, B.S., A.M.*

When the Christmas rush is over and the January inventory has been taken, and work is slack, the average jewelry factory in common with the rest of the world, feels the New Year's impulse toward better things.

The following suggestions were made to a New York factory manager whose shop, while turning out work at a good profit, was behind the times in equipment and spirit. He knew that his plant was in need of new machinery, new arrangement, and new methods, but he did not know where to begin his reorganization. In January, work was slack, so the workmen could be spared for building shelves, repairing floors, and so on, and a little money was appropriated for new equipment. Omitting details, that would be of no general interest, the suggestions were as follows:

FLOORS

Your floors are of wood, in some cases badly worn, in others almost new. First go over your whole plant after the manner of the New England housecleaning—remove everything that is movable, clean thoroughly behind it, throw away everything that can be spared, and give special attention to the cracks and corners. Dust and dirt have no place in any factory; in a jewelry factory there is a double motive for removing dirt, for it will almost always be found that you can get enough gold out of jeweler's dirt to pay twice over for getting it out. Let the floor dry and go over it minutely with a vacuum cleaner, which may be rented for a day or so if you do not care to buy one. Tap the cracks with a hammer, and clean out the dirt behind the wash-barrels and polishing tables, etc. A Cincinnati firm netted $1,200 in this way from a floor they had occupied for some years.

Another plan that is sometimes better is to hire a resurfacing machine from some builder. These machines carry rotating discs of knives, sandpaper, or carborundum which remove the surface of the floor to any depth desired. You will find that the gold you secure from this resurfacing will not only pay the expenses, but will also yield a good profit. In the end you have a clean and smooth floor.

When you build your new addition, lay concrete floors. They are fireproof, chemical proof, sanitary, and can be kept clean with little labor. It does not seem worth while to lay a new floor in your temporary addition, even though there are many cracks, and the wood is badly warped around the steam and water pipes. But this you should do: First mend the cracks and warped places, cleaning out all accumulated dirt, and then cover the floor with a good grade of linoleum, cut with as few seams as possible. This will also serve to make the room warmer in winter and cooler in summer. When you consider its effect on your coal bill, porter's time in cleaning, and precious metal saving, you will see that it will pay for itself and begin to pay a steady profit within a few weeks.

Your present second floor is so badly cut, burned, warped and worn that it should be taken up at once and burned for its gold. Replace it with a composition flooring, made of a plastic magnesia compound that is laid on with a trowel. This is light in weight, fire-proof, cheap, warm, and very easily cleaned. It may be tinted some harmonious color, it is comfortable to the feet, and if properly applied is the ideal flooring for a jewelry factory.

It would seem unnecessary to advise sheet metal on the floor and walls around the furnaces and muffles, but it is a fact that the majority of jewelry factories do not take this simple precaution against fire and loss. See that there are no projecting corners of the metal to harbor dust and precious metal particles, or to tear clothing.

Every jewelry factory should have a cocoa mat at each exit, and the men should be instructed to wipe their feet well before leaving. The dust shaken out of this mat every day will yield good value. Before it is worn smooth burn it and save the ashes. The scheme is being used in a number of shops, and the gold recovered at burning has normally been enough to buy three or four new mats. Woven wire mats under the workers' feet may be used to prevent grinding metal into the floor.

Make it a rule that your floors be kept perfectly free from small and movable objects. Do not let the men make collections of small odds and ends under their benches. Such collections are fire traps, dust and gold traps, and a source of loss in other ways. Notably they make the porter's job much harder and longer; it is easy for him to clean an unobstructed floor, but one that is full of small things with angles and corners takes twice the time, and will continue to waste time day after day. Many of these small objects—cigar boxes, rolls of old wire, etc., can be thrown away. The others should be put into drawers or upon shelves.

WALLS AND LIGHTING

Your walls and ceilings need painting. Paint them white. Not only because it looks clean and inspires cleanliness, but because it will reduce your lighting expenses greatly. The ceiling should be glossy white, the walls very slightly tinted. For health's sake do not use white lead paint.

Even though you have about two electric light bulbs to a man your place is not well lighted. Call in one of the lighting experts sent out by the electrical concerns; he will urge you to spend some money on fixtures, but they will give you more light than you have been getting, for less money. If you have travelled on the new Brooklyn subway you have noticed how bright and cheery the cars are; that is not because they use more lighting current than other cars, but because of their white interior and clever arrangement of bulbs. Contrast them with some of the Lackawanna ferry boats on the Hudson, which are painted dark red inside; they are "lighted" with many bulbs, but because of their dark walls it is a painful task to read in them after sundown.

You may feel a hesitation at spending money on equipment, fixtures, machinery, etc., at this time. But remember that these things will reappear year after year on your inventory, and that in some cases you can realize directly on equipment. But money that is once spent on labor or running expenses is gone forever, never to be available again. Hence you are urged to put in labor-saving devices and other equipment that will cut down such expenses as heating, lighting, and cleaning.

Your men are not especially busy now, so set them to work at building shelves and simple cabinets. Most of your men, except perhaps the most skilled jewelers, will be glad to work at such tasks in preference to being laid off. Build strong, broad shelves, of smoothly planed wood, painted white. Some should be up high, especially the shelf on which cyanide is stored. Others may be breast high or lower. All should be edged with a little

* Consulting Chemist, Jewelers' Technical Advice Co.; New York.

flange to keep bottles from rolling off. Do not fill up your shelves with combustibles, or you will have a fire hazard. Most shelves can be shielded with white oil-cloth curtains, which keep out dust and make the room look bright.

A jeweler may feel that it is none of his business whether his men strain their eyes or not; but it is his business. To permit a man to work at 75 per cent. of his ability is the same as paying him for 33 per cent. more time than he signs up for—the same as paying him eight days' pay for six days' work. If a workman has to work under bad conditions his employer has to be satisfied with bad results; there is no way out of that.

VENTILATION

This leads directly to the subject of ventilation. Your third-floor room is exceedingly hard to ventilate; if the windows are opened there is a draft and those nearby are chilled. Accordingly the windows are closed, even though you have twenty men working there, alongside the pickling vats, melting furnace, cyanide dips, and so on. By eleven o'clock the place is stifling. The men become drowsy and incompetent, and then, in an effort to wake themselves up they get up frequently to walk around, get a drink of water, and so on. By four o'clock it takes all their energy to keep awake and pretend to be busy—they have no energy for work.

Under the circumstances you cannot attempt any radical improvement in your building, such as a worth-while ventilating system. But you can at least use the device that the school teachers use in poorly ventilated classrooms—open all windows and doors during the first half of the noon hour. Open them for ten minutes at ten o'clock and again at three; after that your men may be expected to remain at their benches without interruption for the remainder of the day. Also place an electric fan in the one window that you can open comfortably, the one back of the furnace, and face it outward. The power that this will consume will not be noticed in your monthly bill, and the window is not close enough to the benches to allow the loss of much flying metal.

In this article the floors, walls, and general conditions of the jewelry plant have been considered. In a subsequent paper the equipment, such as wash-barrels, suction devices, furnaces, electroplating instruments, hoods, and so on, will be discussed.

THE ELECTRO-DEPOSITION OF COBALT

The Department of Mines, Canada, recently issued an exhaustive report on "Electro Plating With Cobalt." The report was prepared by Herbert T. Kalmus, B. Sc., Ph.D., assisted by C. H. Harper, B. A., and W. L. Savell, B. Sc. and is the result of researches on cobalt and cobalt alloys conducted at Queens University, Kingston, Ontario, Canada, for the Mines Branch of the Department of Mines

The subject of electro-plating with cobalt has come up from time to time in electro-plating circles and there has always seemed to be an idea that to use cobalt in place of nickel was, if not an impossible operation, too expensive due to the higher cost of cobalt. Based upon the results given in this exhaustive investigation, which has been made by the authors of the report aided by the practical work of W. S. Barrows, foreman electro-plater of the Russell Motor Car Company, West Toronto, Ontario, Canada, it appears that this impression is erroneous and that it is not only feasible to substitute cobalt for nickel, but it is also more economical due to the higher rate of deposition that may be employed with cobalt.

These points, however, as brought out in the present report do not present any information that is particularly new as THE METAL INDUSTRY published in March, 1912, an article by Emmanuel Blassett, Jr., and in June, 1915, one by C. H. Buchanan and Thomas Haddow which contained practically the same conclusions. Inquiry into the market conditions relating to the supply and price of cobalt brings out the fact that there is plenty of cobalt to be had at a maximum price of $1.50 per pound. At this price, judging from the work that has been done in the investigation of the electro-plating possibilities of cobalt, this metal may well compete with nickel.

As far as it is possible to discover there is only one objection to the use of cobalt that might militate against it and that objection at best may be classed only as sentimental, i. e., the color of the deposit, while considered pleasing to the eye, has a distinct bluish cast. This bluish tone, when viewed against the brilliant silver white finish of nickel is instantly recognizable and probably due to traditional preference for the nickel color has caused some criticism adverse to the cobalt plate. This objection, however, as mentioned above is one that may be believed time will soon overcome and therefore it may not be a great while before cobalt plating will be a common operation in the average nickel plating shop.

GENERAL CONCLUSIONS.

The report closes with some general conclusions which are so clear and definite in their wording that it may be well to include them here.

GENERAL CONCLUSIONS FROM COMMERCIAL TESTS ON COBALT PLATING SOLUTIONS.

(1) Several cobalt solutions were found to be suitable for electro-plating with cobalt under the conditions of commercial practice. Best among these are the following:

SOLUTION I B.

Cobalt-ammonium-sulphate, $CoSO_4.(NH_4)_2SO_4.6H_2O$, 200 grams to the litre of water, which is the equivalent of 145 grams of anhydrous cobalt-ammonium-sulphate, $CoSO_4.(NH_4)_2SO_4$, to the litre of water. Sp. gr.=1.053 at 15°C.

SOLUTION XIII B.

Cobalt sulphate $CoSO_4$..	312 grams.
Sodium chloride NaCl..	19.6 "
Boric acid.....	Nearly to saturation
Water	1000 c.c.

Sp. Gr. = 1.25 at 15°C.

(2) Cobalt plates from these solutions, on brass, iron, steel, copper, tin, German silver, lead and Britannia metal articles, of different shapes and sizes, deposited under conditions identical with those met with in general nickel plating practice, are firm, adherent, hard, and uniform. They may readily be buffed to a satisfactory finished surface, having a beautiful lustre, which, although brilliantly white, posseses a slightly bluish cast.

(3) The electrical conductivity of these solutions is considerably higher than that of the standard commercial nickel solutions, so that other things being equal, they may be operated at a lower voltage for a given speed of plating.

(4) Solution I B is capable of cobalt plating on the various sizes and shapes of objects met with in commercial practice at a speed at least four times that of the fastest satisfactory nickel solutions.

(5) Solution XIII B is capable of cobalt plating on the various sizes and shapes of objects met with in commercial practice at a speed at least fifteen times as great as that of the fastest satisfactory nickel solutions.

(6) Plates from both of these solutions on various stock pieces, satisfactorily withstood the various bending, hammering and burnishing tests to which commercial nickel work is ordinarily submitted.

(7) These two very rapid cobalt solutions are remarkable for their satisfactory throwing power. That is, they readily and satisfactorily deposit the cobalt in the identations of the work.

(8) These two rapid solutions operate at these high speeds in a perfectly still solution without agitation of any kind.

(9) These solutions are both cleaner, that is free from creeping salts and precipitated matter, than the standard commercial nickel baths.

(10) The Cobalt deposited at this rapid speed is very much harder than the nickel deposited in any commercial nickel bath. Consequently a lesser weight of this hard cobalt deposit will offer the same protective coat as a greater weight of the softer nickel deposit. Considering solution XIII B, operating at 150 amperes per square foot, on automobile parts, brass stampings, etc., etc., a sufficient weight of cobalt to stand the usual commercial tests, including buffing and finishing, is deposited in one minute. With the best nickel baths, it takes one hour, at about 10 amperes per square foot, to deposit a plate equally satisfactory. Therefore, the actual weight of metal on the cobalt plate must be approximately one quarter that of the nickel.

(11) For many purposes, under the condition of these rapid plating solutions, one-fourth the weight of cobalt, as compared with nickel, is required to do the same protective work. Consequently, if nickel is worth 50 cents a pound, in the anode form, cobalt could be worth nearly $2 a pound, in the same form, to be on the same basis, weight for weight of metal. In addition there are other advantages of cobalt in saving of labor, time, overhead, etc.

(12) A smaller plating room would handle a given amount of work per day with cobalt than with nickel.

(13) With these very rapid plating solutions, by the use of mechanical devices to handle the work, the time required for plating, as well as the labor costs may be tremendously reduced. Solution I B, and particularly solution XIII B, are so rapid as to be revolutionary in this respect.

(14) Obviously the cost of supplies, repairs, etc., would be less with cobalt plating than with nickel plating, as the size of the plant for a required amount of work is less.

(15) The voltage required for extremely rapid cobalt plating is greater than that for most nickel plating baths; it is not so great but that the machines at present in use may in general be operated. For the same speed of plating, the cobalt solution requires much the lower voltage.

(16) For a given amount of work the power consumption for this rapid cobalt work is less than that for nickel. This is obvious, because the total amount of metal deposited in the case of cobalt is very much less, whereas the voltage at which it is deposited is not correspondingly greater.

(17) Ornamental work on brass, copper, tin, or nickel silver would require only a one minute deposit. Even wares exposed to severe atmospheric influences, or friction, could be admirably coated with cobalt in solution XIII B in fifteen minutes. The tremendous possibilities of this solution are not to be completely realized unless mechanical devices are applied to reduce hand labor to a considerabe extent.

(18) Thick deposits from these solutions are vastly superior to any that we have seen produced from nickel solutions. The tendency to distort tin cathodes is less pronounced, while electrotypes and electrodies have been given a superior thick deposit in a most satisfactory manner. The lines were hard, sharp and tough and the surface smooth. Nickel does not equal cobalt for excellence of massive plates.

(19) Many of these tests were passed upon by uninterested skilled mechanics at the plant of the Russell Motor Car Company, who invariably reported in favor of cobalt as above.

(20) Both solutions I B and XIII B are substantially self-sustaining, once they are put into operating condition, and the amount of ageing required to do this is very much less for them than that for the present commercial nickel baths.

TO SILVER PLATE REFLECTORS

For plating reflectors as well as steel knives a solution should consist of not less than three ounces of metallic silver per gallon.

To prepare such a silver solution use the amount of metallic silver stated reduced to nitrate; then to chloride and dissolve in nine ounces of cyanide per gallon of water. Or use about four ounces of commercial chloride of silver and dissolve in nine ounces of cyanide per gallon of water. To every five gallons of solution dissolve ten drops of bisulphide of carbon in one ounce of cyanide and a half pint of water and add to the bath. This will produce a working action to the new bath and produce a more uniform deposit. The solutions given would probably stand from six to eight degrees Baumé.

In order to produce a satisfactory condition for silver plating reflectors the brass, after cleansing, would have to be amalgamated in a mercury dip or nickel plated and flashed in a silver strike solution or the deposit would not hold and would readily peel off under the influence of the buff when the final finish is applied.

To produce the mercury dip dissolve ¼ of an ounce of yellow oxide mercury and six ounces of cyanide in a solution of water. Immerse the polished and cleansed reflectors in the dip for a second or two or until a bright film of mercury is obtained.

If the reflector is to be coated with nickel, first polish, cleanse and then nickel plate for five to ten minutes so that the nickel will stay bright. Wash carefully and strike for a few seconds in a silver strike solution consisting of one-half ounce of silver chloride and eight ounces of cyanide per gallon of water. Arrange as a small plating solution with small silver anodes and use a strong current. The idea is to cover the nickel or mercury surface over as quickly as possible otherwise the silver may peel from the nickel surface.

Nearly all automobile reflectors are being finished in silver by first nickel plating them instead of using the mercury dip which, unless used very dilute, may have a tendency to crack the brass if hard from spinning.—C. H. P.

A TEST OF HACK SAW BLADES

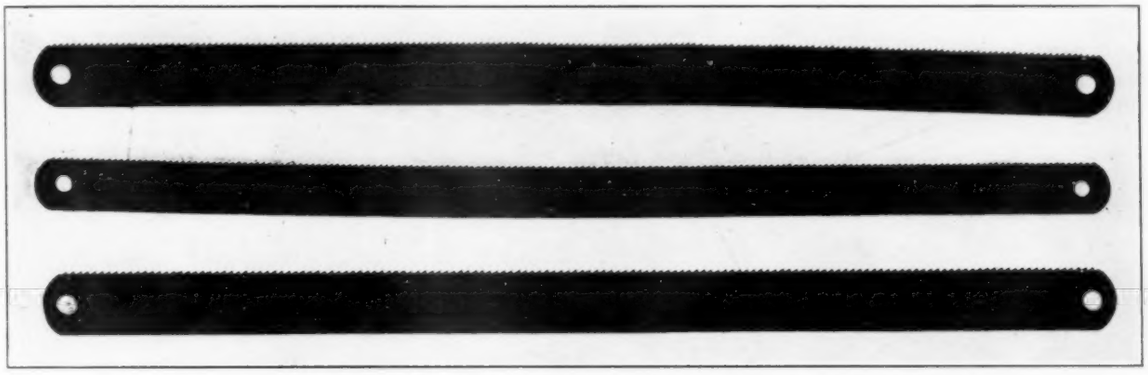
AN INTERESTING COMPARISON OF THE ENDURANCE QUALITIES OF VARIOUS MAKES OF METAL CUTTING SAWS.

An interesting comparison of the workings of hack saw blades made by various manufacturers for foundry purposes was recently carried through by Thomas W. Harper, brass founder, 204 Lafayette street, New York. The test was made in such a manner as to insure absolute fairness to each saw tested. The weight used on the machine was kept in the same position for each saw and the same class of material was used.

A stop watch was used to time the operations and the speed of the saw was, of course, kept uniform for every test. The test was made on the regular bronze bushings manufactured by the Harper Foundry and they were 3 inches O. D., 1⅝ inches I. D. by 12 inches long and the mixture was the well-known bearing metal mixture, 80 copper, 10 tin and 10 lead. A complete table of the results of the test follows:

In talking with Mr. Harper in reference to this remarkable test he said that he had absolutely no other motive in carrying out the test than a desire to know for his own benefit the saw that would do his work at least expense. He stated further that all saws looked alike to him until he had put them into actual use. Mr. Harper had no explanations to offer as to why there should be so wide a difference in the working qualities of the saws on the market. He had an idea that perhaps the width of the saw had something to do with its life as he had found some narrow saws that stood up very well indeed. His main idea, however, is that the quality of the steel and the method of heat treating are the all-important factors necessary to good work in a hack saw.

In justice to Mr. Harper it should be said that he was very reluctant to allow the results of his experiments to be published. It was explained to him, however, that he would be conferring a favor upon other users of hack saws and besides saving others the expense of such tests as well as adding considerable to the literature relating to foundry practice.



THREE OF THE SAWS USED IN THE TEST. PICK OUT THE ONE THAT MADE 36 CUTS.

TEST ON HACK SAWS

Name Cut	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Aver.
Star †	‡5-40	5-43	5-46	5-51	6.5	6-21	6-35	6-55	7-10	7-58	6-39
Sterling	4-27	4-45	5-5	5-5	5-5	6-48	8-25	9-10	10-22	13-1	7-2
Starrett	6-15	6-45	6-55	6-58	6-58	7-14	7-30	7-30	8-14	8-14	7-2
Milford	5-38	6-30	7-01	8-00	8-45	9-06	9-52	10-40	11-30	14-04	9-1
Goodell	5-30	6-45	8-00	9-30	10-52	12-16	13-10	14-3	16-25	18-15	11-29
Disston	5-15	5-47	6-45	7-25	8-8	10-45	11-34	15-40	20-00	21-45	11-14
Atkins	6-30	6-18	6-59	8-00	8-30	17-02	27-33	44-15	46-00	43-00	21-24
Quality	4-50	6-36	10-32	13-16	16-17	21-47	42-10	58-00	90-00	105-00	
Victor	9-00	27-45	40-00	*							
Borroughs	7-00	21-00	90-00	*							
Intra	7-12	10-45	13-45	13-45	15-32	16-10	17-5	18-10	20-15	25-22	15-80

*No signs of finishing cut.
‡The figures mean minutes and seconds.

†This saw was continued for the following cuts: 11th, 10-25; 12th, 10-23; 13th, 11-26; 14th, 12-25; 15th, 12-28; 16th, 12-30; 17th, 12-35; 18th, 12-38; 19th, 12-12; 20th, 13-40; 21st, 13; 22nd, 12-30; 23rd, 13-45; 24th, 14-35; 25th, 14-45; 26th, 16; 27th, 15-9; 28th, 16-10; 29th, 16-20; 30th, 18.2; 31st, 18-2; 32d, 19; 33d, 19-13; 34th, 20-30; 35th, 25, and 36th, 28.

MODERN EQUIPMENT FOR THE BRASS-WORKING MACHINE SHOP

A Description of Air Operated Appliances in the Manufacture of Brass Goods.

By P. W. Blair.*

As air operated tools have enabled many kinds of brass work to be machined with greater accuracy and have also superseded the methods employed before air was used to operate such tools, they are now becoming a standard equipment in up-to-date brass manufacturing plants, and their introduction has effected a considerable saving in the cost of production.

Every modern brass manufacturing plant should be equipped for supplying compressed air to operate pneumatic devices in the foundry and machine departments. Compressed air is easy to regulate as it is almost instantaneous in its action, and at a pressure per square inch anywhere from 60 to 80 pounds, it provides a source of power fully adequate to operate any device now on the market for producing goods at a reasonable cost over the old methods.

By using air power to operate the workman is left free to apply all his energy and exercise all of his ingenuity to rapid production. The different operations of chucking and releasing work and of starting, stopping and reversing the machine can be done rapidly and effectively as the operator has the control of his machine within the space of 18 inches and in quite a number of instances the production has exceeded that of large cumbersome semi-automatic machines, therefore reducing the expense of large tool equipment.

Fig. 1 shows a 16-inch turret lathe with universal chuck and jaws closed and a double acting air cylinder. The master hinge collet chuck is the one used to the greatest extent in a brass shop, as it is designed for round, square and hexagon castings. Owing to the chuck being adjustable it enables the operator to adjust the opening of the jaws to take up any variation in the diameter of the castings. It also allows a square or hexagon piece to enter or a threaded part to screw in or out when finishing on a second operation while the machine is running.

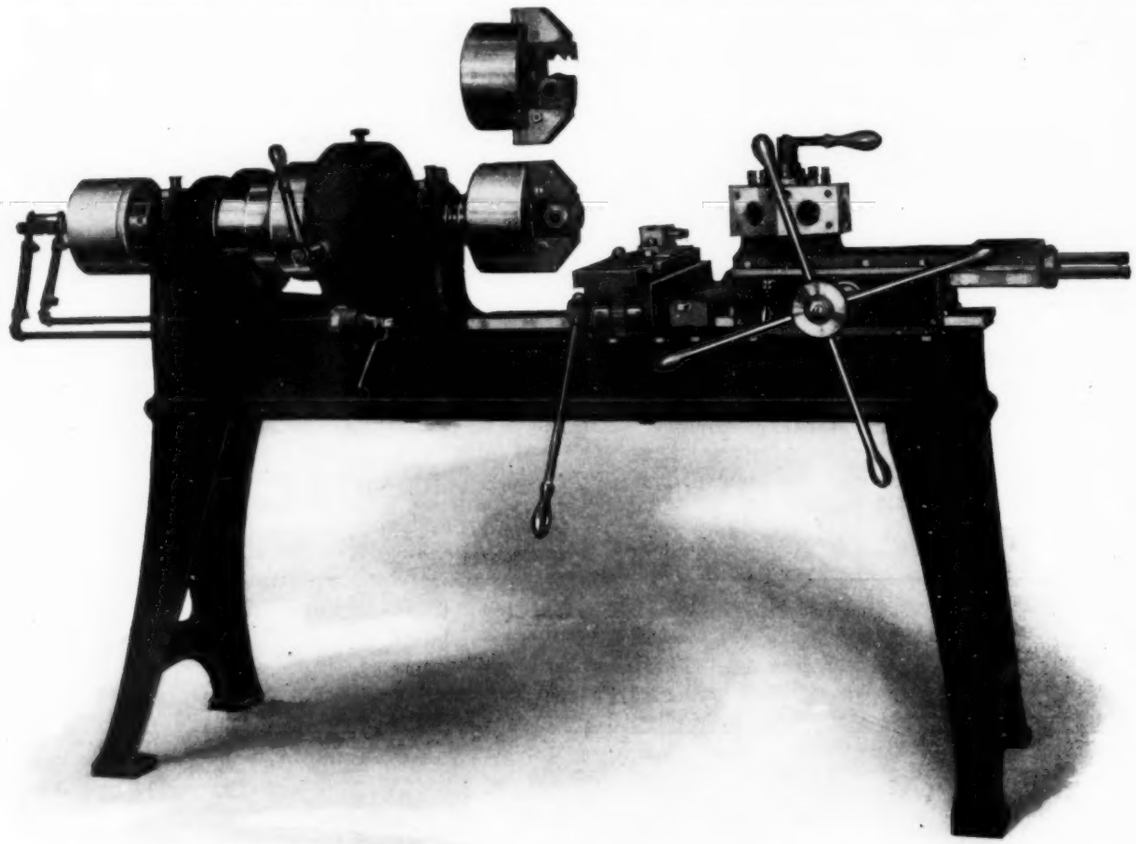


FIG. 1. A UNIVERSAL CHUCK WITH JAWS CLOSED AND A DOUBLE-ACTING CYLINDER ADAPTED TO A TURRET LATHE, MADE BY HANNIFIN MANUFACTURING COMPANY, CHICAGO, ILL.

Fig. 2 shows an alligator chuck with double acting air cylinder. Fig. 3 shows a group of three jaw master hinge collet chucks. The master jaws are attached to the shank by spring hinge joints. False jaws can be made up to any

*Superintendent of brass finishing department of Mueller Manufacturing Company, Sarnia, Ontario, Canada.

desired size at a very low cost, eliminating the old style spring collets which lose their tension and also break off. One of the most convenient chucks to use for irregular castings is the alligator chuck which is easy to operate and simple. Fig. 4 shows a group of alligator chucks.

Owing to the large amount of valves, cock bodies and oil cups having hexagon squares and which are milled on flat in specially designed milling machines shape. A sectional view of a universal chuck and operating air cylinder on lathe spindle is shown in Fig. 6. When the air moves the spindle or piston in or out it moves the shaft back and forth through the head of the lathe. This moves a gear rack which in turn revolves gear wheels so they will move the racks on chuck jaws. Thus the faces of the jaws are moved enough to grip the work or release it. The operator only inserts the work between the jaws and

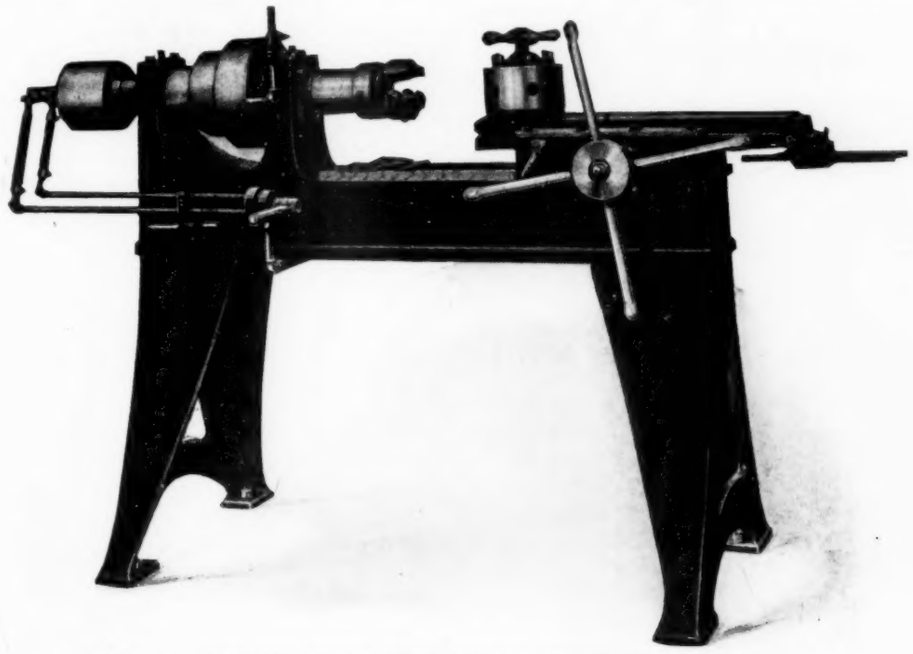


FIG. 2. ALLIGATOR CHUCK WITH DOUBLE-ACTING AIR CYLINDER.

that cut four flats at one time, the time saved in operating the holding of the castings by air in place of the old style arbor where the pieces had to be screwed on and off. With this air chuck the operator places the casting on the head of a plain arbor, turns on the air pressure and the upper holding center or turns his lever to insert the air which instantaneously moves the jaws to grip the work. When the work has been machined it is released as quickly by turning the lever handle of the air valve in the opposite direction.

The air vise has come into universal use and is

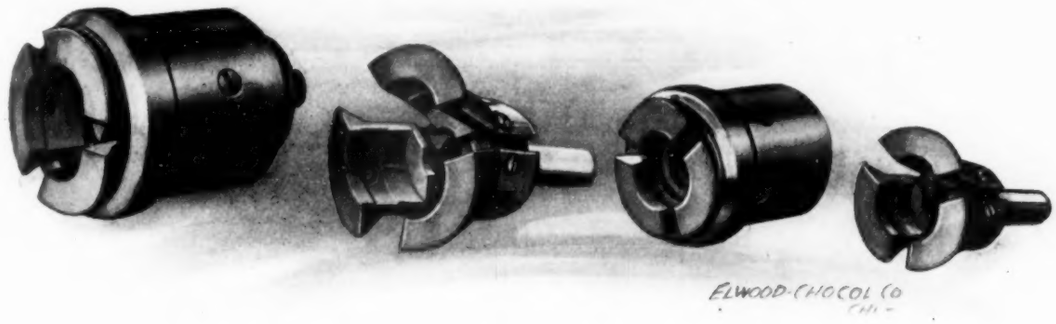


FIG. 3. A GROUP OF THREE JAW MASTER HINGE COLLET CHUCKS.

arbor comes down instantly holding the casting perfectly rigid and ready for milling.

The castings are held rigid and this does away with any chattering, leaving the work with a nice smooth surface. Fig. 5 shows a Master Hinge Collett Chuck with double acting air cylinder. As the old-style box chuck is used more than any other chuck for machining work in a brass shop owing to its capacity for taking all classes of castings with an irregular designed for use in assembling departments to hold work while being assembled. The opening and closing of the vise is instantaneous and the work is held rigid. Fig. 7 shows an air operated vise used for assembling globe valves. Numerous shapes of hinged jaws have been adopted and incorporated in the draw in collet chucks and thus air operated tools can now be obtained for nearly holding all shapes of castings while being machined. Fig. 8 shows a group

of plumbing and steam brass goods machined in air-operated chucks and collets.

Air-operated countershafts are also being marketed by the various manufacturers to operate all kinds of brass working lathes and it would seem as though the only thing left to do was to apply an air brake for stopping the machines quickly. The operator in reversing the air countershaft becomes an expert in bringing his machine to a quick and sudden stop.

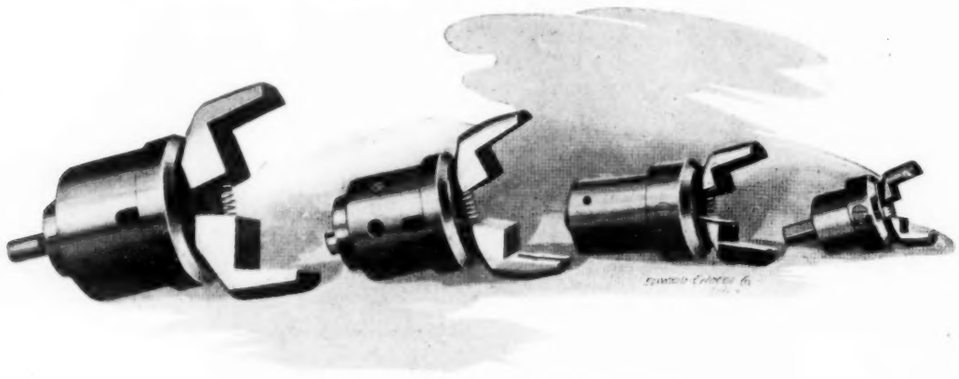


FIG. 4. A GROUP OF ALLIGATOR CHUCKS.

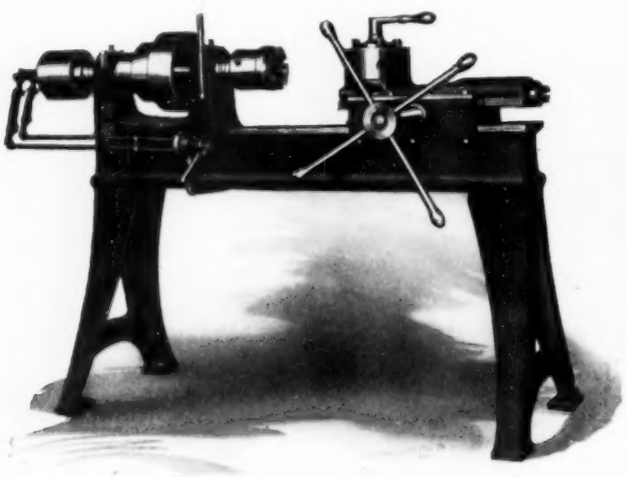


FIG. 5. MASTER HINGE COLLET CHUCK WITH DOUBLE ACTING AIR CYLINDER.

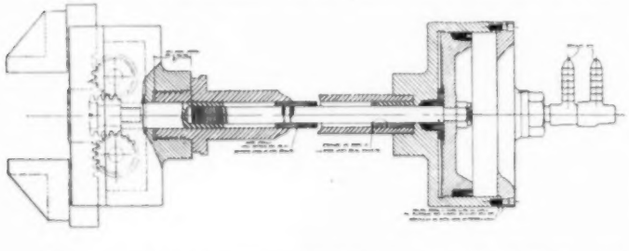


FIG. 6. ASSEMBLY OF TWO-JAW UNIVERSAL CHUCK AND OPERATING AIR CYLINDER ON LATHE SPINDLE.

There are so many devices and tools in a brass plant that can be rigged up to be operated by compressed air that it is impossible to mention them all. When so equipped the operator can chuck the work and remove it from the machine so fast that the saving is from 25 to 30 per cent.

Since the introduction of the automatic buffing machine which is in use one of the problems has been overcome through the use of air in holding the large variety of work which can be accomplished on the automatic buffing machine.

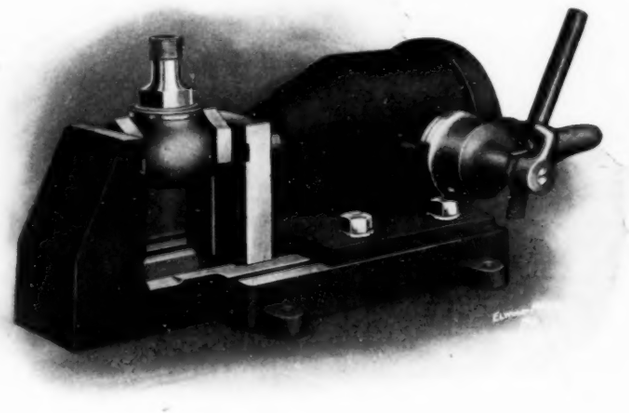


FIG. 7. AIR OPERATED VISE FOR USE ON GLOBE VALVES.

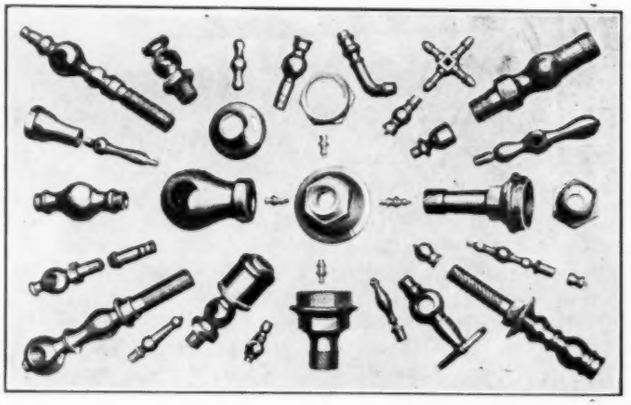


FIG. 8. GROUP OF PLUMBING AND BRASS GOODS MACHINED IN AIR OPERATED CHUCKS AND COLLETS.

EDITORIAL

OLD SERIES
Vol. 22. No. 1

NEW YORK, JANUARY, 1916.

NEW SERIES
Vol. 14. No. 1

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Published Monthly

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CONTENTS

THE METAL INDUSTRY IN 1916

In keeping with the present extraordinary prosperity THE METAL INDUSTRY emerges from the past two years of business depression with a journal of 172 pages—the largest we have ever issued.

It is extremely gratifying to the publishers that none of the advertising secured for this enlarged publication has been ordered under a time contract, but is inserted until forbid, without extra charge for a short time period, the advertiser simply placing his advertising on the results that the paper can bring him.

For a number of years we have believed that the only fair way of securing advertising was on the basis of making the advertising pay the advertiser; rather than by the usual method of securing long time contracts at reduced rates by promises of results, and then holding the advertiser whether or not he was satisfied.

It has also been the practice for trade journals to make all kinds of concessions when the time was due for the renewal of contracts, or bring pressure to bear in such a manner that sometimes it takes more courage to refuse to renew a contract than to sign one.

We are glad to say that THE METAL INDUSTRY does not have to resort to such practices but solicits advertising only on the merits of the publication and the business that we can bring to our patrons.

Our total issue with the beginning of the New Year consists of 19,500 copies (American, English and Directory Editions). We can, therefore, safely say that THE METAL INDUSTRY completely covers the field.

A sworn statement of THE METAL INDUSTRY'S circulation is issued each year and figures in detail are cheerfully furnished about where and by whom THE METAL INDUSTRY is read.

Throughout 1916, as in former years, we shall take particular pains with our reading matter, always bearing in mind that the Editorial portion of the journal is of primary importance, for without reliable, accurate and interesting text a journal will have no subscribers and without subscribers a trade journal is surely of no benefit to its advertisers.

As in the past the leading writers of the world on metallurgical, mechanical and electro-chemical subjects will continue to contribute the latest and best shop practice for the benefit of THE METAL INDUSTRY readers and all of our various valuable departments will be maintained at the same standard of excellence.

In fact, every effort will be constantly continued to make THE METAL INDUSTRY larger, better, more interesting than ever.

RETROSPECTIVE REVIEW OF 1915—OUTLOOK FOR 1916

A Brief Report of Business Conditions Existing in the Metal Industries for the Past Year and Prospects for 1916.

The year 1915 has been one of startling surprises, but so rapidly have the big operations in almost every line of business been carried on that as usual they have become old stories. When one hears today of enormous orders for practically everything manufactured in this country no astonishment is shown and the report is accepted without question. We do not believe that the conditions in the metal lines were ever better than at present. Beginning with the opening of the year the demand for metal products began to increase and concordantly with that demand up went the price of both raw materials and manufactured products. The war across the water of course is primarily the reason, but as we said in our January, 1915, review, the business world had at the close of 1914 begun to discount the effect of the war and the wheels of progress had begun to turn, slowly at first but more rapidly until at the close of 1915 everything is running full tilt and everybody has a job. The steel and brass business have been, of course, the largest gainers in the wonderful prosperity which has been and is being enjoyed. Capital has been less conservative and has turned a willing ear to proposed investments.

This has been particularly noticeable in the brass business. We cannot find in the last ten years such a record of extensions, additions and new plants as have taken place in the past year. We do not believe that there is a brass mill or foundry in the country of any size that has not added or is not planning to add to their capacity for production. Some plants have devoted their efforts to adding to their melting capacity alone as for instance, the Buffalo Copper and Brass Rolling Mills, Buffalo, N. Y., added 200 fires, Michigan Copper and Brass Company, Detroit, Mich., 60 fires; Coe Brass Branch of the American Brass Company at Torrington, Conn., a million dollar casting shop with upwards of 250 fires, and so on. Other plants have built extensions to both mills and casting shops as the Chase Metal Company, Waterville, Conn., a photo of whose new plant is shown on the first page of this issue of The Metal Industry. The Scovill Manufacturing Company, Waterbury, Conn., has built and is building continuously new buildings. The Bridgeport Brass Company, Bridgeport, Conn.; Waterbury Clock Company, Waterbury, Conn.; Plume and Atwood Manufacturing Company, Thomaston, Conn.; Waterbury Farrel Foundry and Machine Company, Waterbury, Conn., and the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa., have all built large additions to their plants as well as a great many others.

The above list covers only a portion of the wonderful expansion that has been going on all over the country and if we had the space we could describe a great many of them, not only in the metal manufacturing line, but in industries utilizng metals such as the automobile and its accessories. When we predicted in January, 1915, that better business conditions would soon be observed we of course did not dream of any such prosperity as has marked the year just gone. When Charles F. Brooker in May, 1914, addressed the American Copper Producers' Association at a dinner given in his honor and said:

"The wave of prosperity may recede for a time, but when the tide turns, as it always has and always will, it will reach a higher point than ever before, and our history of continuing development will repeat itself."

He was certainly prophetic and his faith was strong, but we do not believe he himself had any idea that the tide would set in so strong in so short a time and would continue to run so rapidly as it does today with no sign of an ebb!

NEW PLANTS AND THEIR FUTURE

The Metal Industry has from time to time recorded the establishing of new plants in certain parts of the country, but mostly east of the Rocky Mountains. Among those that have been mentioned are the Western Cartridge Company, Alton, Ill., brass mill; Montreal Munitions Company, Lachine, Quebec, brass mill; Bridgeport Arms Company, Bridgeport, Conn., arms plant; National Brass and Copper Company, Lisbon, Ohio, brass mill; Stamford Rolling Mills Company, Stamford, Conn., brass mill; American Cupro-Nickel Company, Stamford, Conn., brass rolling mill; Kennedy Corporation, Oakmont, Pa., brass mill; J. B. Wise, Watertown, N. Y., brass mill; Quigley Furnace and Foundry Company, Springfield, Mass., brass mill; Continuous Casting Corporation, Newark, N. J., brass and bronze rod mill, and George S. Youngs, Bridgeport, Conn., brass casting shop. There are also a number of shops and mills projected, but whose plans are too immature to warrant publication.

We wonder what will be the future of these new plants? With the older and firmly established plants evidently able to take care of normal business, adding to their already enormous facilities on account of war orders what will be the outcome when the war is over and a period of reconstruction sets in?

It seems as though a great competitive era will ensue and there will be a great scramble for business and prices will tumble. At the present time the presumably high prices ruling for brass products appeal with prospects of great profits, but do they? It must be admitted that in the case of an established plant with a perfect organization, its overhead expense at a minimum and its methods of manufacture perfected after years of experiment there is a good margin on war orders. But in the case of a new plant the conditions are somewhat different. High prices must be paid for equipment and labor. There is no time for experimenting, consequently experience must be bought at a high price if obtainable at all. Copper and spelter are higher in price than ever before, particularly so in regard to spelter and specifications are

being made more rigid every day. So taking it all in all the way of a new plant must be hard at the start. Overhead expense must be set at a high figure and this together with labor and costly mistakes, which are bound to occur, must be charged against the seemingly high profits which leaves a margin after all not so attractive!

The depreciation in a brass mill under ordinary conditions is large and with everything running at the high rate necessary today, depreciation will increase very rapidly with no time to check it. After the war then it seems to us the business will go to the mills best able to handle it at lowest figures and these logically will be the oldest and best organized, while the others will be either absorbed by the larger ones or go in the scrap heap. By what we have said above we do not mean that we believe there is going to be a depression in the brass business for the signs point the other way. But we do mean that there will be over capacity and this is due to the feverish haste in which the demand today must be met. With the market abroad for the enormous amounts of brass stopped or slowed down, the time limit for deliveries will be lengthened and prices are bound to drop and the fight for business will begin.

The activity in the brass business for war materials is duplicated in other lines and the conditions in all trades are reported in our Trade News columns in this issue of THE METAL INDUSTRY. A careful perusal of these will show the country to be in a very prosperous condition.

NEW THINGS IN 1915.

So few machines and processes were brought out in 1915 that in ordinary times alarm might be felt for the ingenuity of the country. The reason, however, is plain; manufacturers have been and are so busy producing the thousand and one standard articles to satisfy the enormous demand that there has been little time for development. The most notable things, however, that THE METAL INDUSTRY has been fortunate enough to chronicle are as follows: The Mellen Rod Casting Machine described in July, 1915. A machine which casts a brass or other metal rod direct from molten metal to nearly finished size. One of these machines is now operating daily at the plant of the Continuous Casting Corporation at Garwood, N. J.

The building, launching and destruction of the seagoing auxiliary yacht "Sea Call." This boat was described in August and the story of her destruction was given in November. The "Sea Call" was built with Monel metal plates and because these plates were connected, without insulating material between, to steel ribs, corrosion of the steel set in and the boat was destroyed three months after launching.

The Wilzin process for the manufacture of flatware was described in September. This process consists in squeezing up into shape under enormous pressure, a spoon or fork from a blank without intermediate annealings and with a scrap loss of 5 per cent. as against 40 to 50 per cent. by the ordinary rolling process. One of these machines is in operation at the plant of E. W. Bliss Company, Brooklyn, N. Y.

The inventors have been busy during the past year and 144 patents have been described in THE METAL INDUSTRY covering all phases of the casting, founding and finishing of metals.

ASSOCIATIONS AND SOCIETIES

The societies connected with the metal industries held their usual meetings and conventions during the year and these have been faithfully reported by THE METAL INDUSTRY. The American Electro-Platers' Society held its annual convention at Dayton, Ohio, in June, and made history. This was described in the June issue of THE METAL INDUSTRY. The American Society for Testing Materials held its usual meeting at Atlantic City, N. J., in June. The American Electrochemical Society held its usual two meetings, one in April at New York and one in September at San Francisco, Cal. The American Institute of Metals had a very successful convention in September at Atlantic City, N. J. A full account of this convention was given in the October issue of THE METAL INDUSTRY.

OUTLOOK FOR 1916.

One of the leading factors that will have to be reckoned with in connection with business prosperity in 1916 is the tariff. We have now had the low tariff in force long enough to see its effects and contrary to expectations and promises that it would lower the cost of living the opposite has been the case. Imports to the value of $38,057,733 entered the thirteen principal customs districts of the United States for the week ending December 11, 1915. On these imports the Government realized a revenue of $4,029,706, an average duty rate of 10.5 per cent. compared with an average duty rate under the old law of 19 to 22 per cent. About 70 per cent. of our imports are now coming in free of duty which according to theory should decrease living costs. Nevertheless the index numbers recently compiled by Bradstreet show a steady rise which is sufficient proof that the tariff has nothing to do with the matter. The only beneficiaries of the present tariff law have been the importers who bring in articles free of duty to compete with domestic production. If the old duty law was still in force there would be no necessity for the extension of the war revenue measures.

One bright ray of light that shows out through the gathering clouds of tariff debate that attends the coming presidential election is the movement set on foot by the United States Chamber of Commerce for a permanent tariff commission.

This commission as set forth in a pamphlet just issued by the Chamber of Commerce will be non-political in character and will be made up of business men who are specialists in their line. The commission will be appointed by the President and will have seven members. The duty of the commission will be to ascertain the facts only relating to manufacturing costs and present them to the tariff committee from Senate and House. With the tariff question settled or in prospect of being settled we see no reason why 1916 should not be a banner year in fact as well as in theory.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY.

SPELTER

To the Editor of The Metal Industry:

"I'm from Missouri and have to be shown," was and possibly is a slang phrase used by doubting Thomases the world over, but it has lost its application in so far as it actually affects the citizens of that state indigenous to the soil of and around Joplin, for at the present time, and for sometime past, they have been doing the "showing" in the line of spelter.

In producing fancy brand names they are fairly clever and should a buyer, in his anxiety to get spelter of any kind regardless of brand be willing to accept what is offered, he is liable to have handed to him the sourest lemon from the zinc tree. Here is about the dope they hand you. "We are now prepared to place on the market our new brand of spelter known as 'Exaspo' which we know will meet all the requirements of our most exacting customers."

Suppose you bite at the bait offered and order a jag of it, what do you find? First of all the fracture looks suspicious, but you go further and have it analyzed with the result that the chemist finds a little tin, lead and iron, not so much as would fill a well, but all three amounting to 1¼ per cent. or so and you say to yourself, "well it is not so rotten at that." You then go ahead and use it with the result that your castings look as if they had suffered from smallpox, glanders and the pip. Then you get up on your hind legs and yell bloody murder and wonder what can be the matter with the "Exaspo" brand of spelter.

Perchance your acquaintances are not numerous enough to include a galvanizer or two, but if you will take a sample of "Exaspo" to any galvanizer and at one glance he will tell you more about spelter than you ever knew. The first crack out of the box will be something like this, "Why that's not spelter, that's dross" and you can bet your last jitney that he will be right ninety-nine times out of every hundred guesses.

To the brass foundrymen of today, particularly the jobbing shop proprietor the best dope on tap in the spelter game is to buy it in the shape of punchings from rolled stock because the best of zinc is always used for that kind of goods. There has been in the past year more poor spelter made, not refined, than at any other period of time, but the prices asked and obtained have been and are right now outrageously high, with the end not yet in sight.

The operators are not only hungry after your money, but they do not give value for it and if you can afford to pay the abnormal prices asked for slab spelter today, then by all means stick to the old reliable brands and do not flirt with unknown kinds with fancy names and a trifle lower in price. The plight of the galvanizer is even more serious than that of the founder as the price of spelter is so high that they have been compelled to raise the price of galvanizing proportionately, with the result that they have lost lots of their customers, who now coat their work with some other rust resisting compound which, while it is not as good as galvanizing, answers the purpose for the time being.

Again the most of the new brands of spelter are so loaded with dross that the galvanizer who tries to use them will find his "kettle" so full of it that he will be kept busy bailing it out, which in plain English means that he will do no galvanizing.

W. H. Parry.

Brooklyn, N. Y., December 24, 1915.

SILVER DETERMINATION

To the Editor of The Metal Industry:

In reading the December issue of The Metal Industry my attention was drawn to an article by L. C. Wilson on "Determination of Weight of Deposit." The writer outlined several ways of determining silver. Of the methods described the one involving the use of the thiocyanate process was most interesting.

It was noted in the article that the sample of silver solution containing free cyanide was treated with sulphuric acid before titrating with thiocyanate solution. I would like to suggest the following preliminary procedure as carried out in our laboratory for preparing the sample for titration. "Ten cubic centimeters (c.c.) of silver solution are diluted with 30 c.c. of distilled water. The silver is then precipitated by adding 15 c.c. of a 10 per cent. filtered solution of commercial liver of sulphur. This amount of precipitant is sufficient when silver is present up to 4 or 5 ounces per gallon. However, an excess of liver of sulphur solution does no harm. If the silver can be precipitated at night, it will be found that the residue can be filtered off very rapidly the next morning. In any case, the precipitate or residue is filtered off and washed with distilled water a few times to get rid of any free cyanide present. The precipitate in the filter paper is then decomposed by heating with nitric acid (1; 1) in a small Erlenmeyer flask until all brown fumes of oxides of nitrogen are expelled. The liquid is then filtered off from the macerated filter paper in the flask, afterwards washing the paper with distilled water. To make sure of thorough washing the chloride test may be applied to determine the presence or absence of silver nitrate. If the test indicates absence of silver nitrate, shown by non-formation of silver chloride on adding hydrochloric acid, the filtration may be considered complete. After cooling, the solution is titrated with thiocyanate solution using ferric alum solution indicator, as described by Mr. Wilson in his article.

I claim the desirability of the above outlined preliminary procedure on at least two points. It is economical from the standpoint of time and the undesirable cyanide fumes are eliminated. The actual time consumed to complete one determination does not exceed twenty minutes. This preparatory method is also accurate. Good practical results are obtainable with reasonable care practised in manipulation. I have found that there is no appreciable loss of the precipitate (silver sulphide) due to free cyanide present in the original sample. In tests made here, free cyanide of potash up to 6 ounces per gallon has been present in the samples. Ordinary quantitative filter papers (9 cm. diameter) are used to hold the precipitates. Enough titrating solution and indicator can be made up at once so that the time consumed does not amount to much, where quite a number of determinations are to be made. However, if a large number of determinations are not run at once so as to use up the thiocyanate solution, it is just as well, for the titrating solution is quite stable when kept in a well stoppered bottle.

H. J. Blanchard,
Foreman Plater, Wm. A. Rogers, Ltd.

Niagara Falls, N. Y., December 29, 1915.

NEW BOOK

SAFETY IN THE FOUNDRY.—By Magnus W. Alexander, chairman of the Committee on Safety and Sanitation of the National Founders' Association. Size, 5½ by 8 inches. 188 pages with 140 illustrations. Bound in flexible leather. Published by the National Founders' Association. Price $1.50 For sale by THE METAL INDUSTRY.

This book has grown out of the investigations which were carried on during the past two years in connection with the work of the Committee on Safety and Sanitation of the National Founders' Association. Much of the information gathered was published by the Committee in the form of bulletins. The book contains this material in revised form, brought up to date and enriched by illustrations not published heretofore. Many new features have been incorporated and entirely new chapters have been added, in the hope that the book may thus more completely serve as a guide to foundry managers in conserving the safety and health of their employees.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE.

ALLOYING

Q.—Kindly let us know of a formula of an alloy used in making white gold, 14 and 18 karat.

A.—White gold may be produced of 14 or 18 karat fineness by using 14 grains of gold and 10 grains of silver for 14 karat and 18 grains of gold and 6 grains of silver for the 18 karat.

The usual white gold alloy is 12 grains of gold and 12 grains of silver, which of course makes a 12 karat alloy.—K. Problem 2,237.

CASTING

Q.—Would an iron mold having twelve circles with gate running in the center and cover attached to mold, when pouring, give good results? I am desirous of making these rings out of pure copper, that is, no alloy, and as I have had considerable experience in handling copper I know that when copper is cast in sand it is difficult to procure a solid casting. The object in making these rings as described above is to try and utilize copper turnings direct from the ring itself after being machined.

At the present time we purchase the rings which are made from copper tubing cut to size and there is a considerable amount of turnings and borings. I have come to the conclusion that we could use the turnings by melting same and pouring into iron molds. Is there any particular flux that you could recommend to use in the molten copper in order to get a solid casting?

A.—There are several difficulties in the way of your making expansion bands for shells by the method you have outlined. In the first place when copper turnings are melted they oxidize and the resulting metal must be poled in order to get it in tough pitch. This poling can only be done satisfactorily in a large reverberatory furnace.

Even if you used ingot copper for making these castings they would crack unless a collapsible core was used. Also it is necessary to use copper molds when casting copper as iron molds do not give solid castings. Charcoal is the best covering to use for the molten copper.

It would be perfectly possible for you to cast your copper into small discs in open copper molds and to stamp deep cups out of these discs that would furnish one or more bands each. This process would produce considerable scrap copper, but it would give good bands.—J. L. J. Problem 2,238.

DIPPING

Q.—Will you kindly inform me how to make the saltpeter dip and what kind of tank to use?

A.—The nitrate of sodium, commonly termed saltpeter, immersion solution for the production of gun metal finish upon steel or the production of royal copper is manipulated as follows:

First—A cast iron kettle or fire clay crucible such as is used in melting metals should be procured. Second—In this receptacle sufficient of the saltpeter should be placed so when melted by heat the receptacle is about two-thirds full. No water is added to the material.

In coloring steel about 1 ounce of black oxide of manganese should be added to 5 pounds of the saltpeter, but in coloring copper this may be omitted. The articles should be cleansed and perfctly dry and it is advisable to heat them to 200 or 300 degrees Fahrenheit before immersion.—C. H. P. Problem 2,239.

GRINDING

Q.—What is the best method to follow in setting a diamond for truing or turning up small 6-inch and 12-inch emery wheels?

A.—The diamonds used for truing grinding wheels are usually set in the end of a soft steel rod. A hole is drilled in the end just a little deeper than the length of the stone and of the same diameter as the thickest part. The diamond is then fixed in place by carefully pinning the metal over it by using a small set. The end of the rod is then ground away to expose part of the diamond.

Another good method is to brake the diamond in position by first drilling a hole a little deeper than the largest dimension of the diamond. Do not use oil as a lubricant when drilling, as oil of any kind tends to prevent the spelter from flowing smoothly.

The molten spelter is now poured into the hole filling it completely, and the diamond held by a pair of tweezers is pushed into the liquid spelter until it strikes the bottom. After the spelter has cooled the end of the rod in which the diamond is located can be shaped in the customary manner.—P. W. B. Problem 2,240.

MELTING

Q.—Kindly let us know if it is practical to melt iron in a brass furnace?

A.—If you want to melt only a small quantity of iron in your brass furnace it is entirely practical to do so provided you have sufficient draft. Otherwise it is better to melt it in a cupola.—K. Problem 2,241.

MIXING

Q.—Will you kindly give me what in your knowledge has proven to be the best commercial formula for mixing brass for globe valve bodies, disc stems and bonnet castings, these valves to be of metal disc regrinding type and suitable for pressures of from 200 to 250 pounds of steam.

A.—The best commercial formula for an ally suitable for steam pressure of 200 to 250 pounds is copper 87, tin 6, zinc 5, and lead 2.

Where the lowest possible cost does not have to be considered the mixture of copper 87, tin 8, zinc 4 and lead 1 is recommended. Manganese bronze is coming largely into use for stems of all large valves.—J. L. J. Problem 2,242.

OXIDIZING

Q.—Will you kindly tell me the best way to keep a Hawley down draft furnace clean, for after running a short time it gets filled up with dross and dirt? We melt from 500 to 1,000 pounds in each heat and 4 heats in every 10 hours. We use 50 per cent. of copper and the gates from the last heat.

A.—We believe that you make oxide about as fast as it is possible to do it. If you were melting a higher copper mixture than is found in yellow brass you might be able to get better results, but the nature of the brass is such that the zinc is oxidized before it is melted as well as afterwards and thus increases enormously the amount produced in ordinary practice.

We would not advise the melting of yellow brass mixtures in this furnace unless there was some way to get a reducing flame to come in contact with the metal. We would suggest melting yellow brass, to get good results, in a furnace where the fuel does not come in contact with the metal.—K. Problem 2,243.

PLATING

Q.—Please give me a formula for a McKinley gold solution containing cyanides of the metals.

A.—A McKinley gold solution is difficult to control unless you have had some practical experience with such a solution. The following formula gives good results:

Water	1 gallon
Sodium cyanide	4½ ounces
Copper cyanide	1 ounce
Zinc cyanide	3 ounces
Nickel carbonate	¼ ounce
Ammonia water, 26%	2 ounces

Run the solution at a temperature of 160 degrees to 180 degrees Fahrenheit, otherwise the zinc will predominate in the deposit. A very little arsenic may be added to the solution for this purpose. Cut down 4 ounces of arsenic in 4 ounces of caustic soda and dissolve in one pint of warm water, but only add about 10 drops per gallon of solution. The articles should be acid dipped after plating to bring up the color. A small amount of chloride or carbonate of iron dissolved in cyanide also assists in bringing up the gold tone, but not more than ⅛ of an ounce of iron per gallon of solution should be used.—C. H. P. Problem 2,244.

Q.—Will you be kind enough to tell me what I can do with a solution of nickel which has been standing for the past ten months without being used and which is dark and grayish in color? I don't know what there is in the solution, but I have tried everything to make it white and have not succeeded. The solution stands six degrees Baumé.

A.—First—Add water to the solution so that it will register five degrees Baumé. It must be very concentrated after ten months due to the evaporation of the water.

Second—Test with litmus paper, both blue and red, to determine whether the solution is acid or alkaline. (Blue litmus paper turns reddish if the solution is acid and red paper turns blue if alkaline).

The solution should be very faintly acid to accomplish this. Dissolve a few ounces of sulphuric acid in water and add to the solution stirring well and make a paper test at each addition of the acid water. Then electrolyze your bath for several hours by hanging a number of anodes on the negative pole. Then note what kind of a deposit you obtain in a half an hour. If it is still dark add two ounces of each of common salt and sal ammoniac to each gallon to increase the conductivity of the bath. These additions should bring the bath to its normal condition.

If the bath should prove to be acid to the litmus paper test then add sal ammoniac only with a little free water of ammonia, instead of the other additions given.—C. H. P. Problem 2,245.

Q.—Would like very much to have you give me a receipt for electro-plating plaster paris.

A.—Briefly mentioned the method used for preparing plaster paris for electro-plating is as follows:

First—The plaster object should be thoroughly dried by the aid of heat.

Second—The plaster should then be coated with at least two thin coats of orange shellac, dissolved in denatured alcohol and applied with a soft brush and then thoroughly dried.

Third—The third coating of shellac should have Venice turpentine incorporated with the shellac so that when the shellac coating commences to dry it will remain tacky.

Fourth—Rub into the tacky surface finely divided copper bronze powder, known as platers' copper bronze. Apply this powder with a soft brush, but be sure that the surface is completely covered with the powder. The surface should then be thoroughly dried and the excess of powder removed with a soft brush.

Fifth—Wire the plaster casts carefully with soft copper wire and then plate in an acid copper bath; the composition of the bath should be as follows:

Sulphate of copper	2 pounds
Glycerine	1 ounce
Sulphuric acid	2 ounces
Water	1 gallon

Plate for at least two to three hours. After copper plating the object may be afterwards finished in any other solution or finish as desired.—C. H. P. Problem 2,246.

ROLLING

Q.—Will you kindly say if brass ingots of the following mixture will roll—copper 56, spelter 42, and lead 2, and what diameter ingot you would suggest for 2 1/16 diameter finished bars?

A.—The mixture copper 56, spelter 42, lead 2, may be extruded hot. It may also be cast into round rods or billetts and hot rolled into wire or rods. The heating of these rods previous to rolling should be handled by a competent man, as the secret of successfully working this mixture lies in the temperature as well as the groving of the rolls. By careful selection of the stock and subsequent handling it may be possible to hot roll this mixture in flat cakes. However, this is a somewhat ticklish proposition. I would not recommend trying to work this mixture cold. A casting 3 inch thick would do for a flat hot-rolled cake, and for a round rod a casting 2¾ inch or more in diameter would answer for a 2 1/16 inch finished rod. A casting 2¼ inch in diameter may be made and the rod "scalped" down cold to size on an ordinary draw bench. This last method would probably answer providing the physical requirements are not too great.—R. A. W. Problem 2,247.

SOLDERING

Q.—Will you kindly give us the formula and the procedure for making fine, medium and coarse grained braziers spelter, and also the method of handling same so as to keep the yellow appearance?

A.—Braziers spelter or hard solder is made of a mixture of 50 parts of copper and 50 parts of spelter. The metal is poured into an iron mold and then is broken up either in a special grinding machine while red hot or is hammered up in a mortar.

The various grades are produced by screening and the yellow color is to be had by dipping the final product in a quick dip composed of equal parts of strong nitric and sulphuric acids.—K. Problem 2,248.

WAXING

Q.—We would like to know if there is a material to take the place of wax in electro-plating molds.

A.—Molds are now made with fusible alloys instead of wax and then metallizing as in the old fashion manner. The advantages are that copper can be deposited without any difficulty whatever in the ordinary acid copper solution after the electrotype is produced and the metal can be melted out at a temperature a little above boiling water. Below is given a list of compositions and their melting temperatures.

Lead	1 part	2 parts	3 parts
Tin	1 "	2 "	3 "
Bismuth	1 "	2 "	1 "

Melting Temperature: 258° Fahr.—283° Fahr.—311° Fahr.

Ozokerite tempered with beeswax is almost universally used in electrotyping. An imitation may be prepared by melting the following together:

Paraffin wax	50 parts by weight
Japanese vegetable wax	30 " " "
Rosin	10 " " "
Ozokerite	5 " " "
Tallow	5 " " "

—C. H. P. Problem 2,249.

ZINCING

Q.—I am producing a steel shell ½ inch in diameter and 2 inches long, which must be rust-proof. Barrel plating will give a satisfactory coating on the outside, but I understand will not plate the inside. What I would like to know is what the cheapest commercial method of plating this shell inside and approximately the cost per hundred. The coating inside could be brass or copper, but I pressume the same difficulty applies to all electrically deposited metals.

A.—It is extremely difficult to obtain a uniform deposit of any metal on the inside of a shell ½ inch in diameter and 2 inches long. Copper or brass deposits de not give a rust proof coating upon steel.

Electro-zincing, commonly termed electro-galvanizing, gives the best protective coating to steel, but the same difficulty would be experienced as far as the inside is concerned in obtaining a uniform coating.

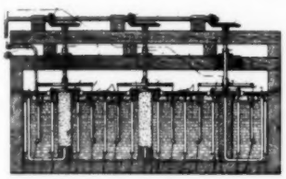
A special form of tank might be arranged for the plating of such articles so that small anodes properly arranged could be placed inside the shells. In this manner a uniform coating could be obtained inside and out. Otherwise galvanizing would be the only way out.—C. H. P. Problem 2,250.

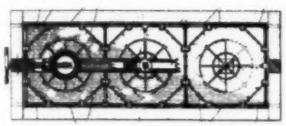
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST.

1,161,226. November 23, 1915. **Electro-plating Apparatus.** W. F. Koken and H. J. Richards, St. Louis, Mo.

This invention relates to a moving electroplating apparatus. The main object of the invention is to provide a practicable apparatus, as shown in cut, for electroplating objects of various sizes and shapes, which permits the use of a high current density and produces a better deposit, and in less time than is possible with a "still" plating process.





Another object is to provide an electroplating apparatus which is not only as reliable and efficient as a still-plating apparatus, but which is so designed that it prevents the formation and adherence of gas, and enables articles to be plated in a fraction of the time required to plate articles by the still process now in general use. And still another object is to provide a compact electroplating apparatus which is so designed that it is not necessary for the workmen to handle or change the position of the articles during the process of plating same.

1,162,823. December 7, 1915. **Strip Solder.** C. P. Tolman, New York. Assignor to National Lead Company of New York.

The purpose of the invention is to facilitate the transport, mode of dispensing and use of strip solder, or solder wire, generally heretofore sold and used in continuous lengths as unwound from spools or hanks.

The invention consists in the manner and means of assemblage of solder strips in unit package form, whereby certain economies and conveniences are attained.

The solder wire or strip may be of round, flat or angular section and of any composition, with or without a flux incorporated with it. Several sections of such wire, each of substantially the same length and assembled in substantially parallel arrangement, are joined together at one end of the assemblage by means, as shown in cut, which permits individual sections to be bent back singly or in groups as required for use, while the remaining wires still retain their bunch formation. The turned back wire is thus rendered available for application to the joint to be soldered, while the rest of the bunch forms a convenient handle, particularly efficient in that it possesses large superficial area from which the heat may be dissipated by radiation.

1,163,286. December 7, 1915. **Process of Recovering Zinc from an Acid Sulfite Solution.** C. S. Vadner, Salt Lake City, Utah.

It is well known that in various smelting operations, in roasting ores, and in various other operations that produce sulfurous gases, that a large amount of obnoxious fumes are emitted into the air, and that these fumes and gases are a source of annoyance and injury to animal and vegetable life. While the mechanical impurities contained in these fumes can be fairly well arrested by the baghouse system, and by the use of long flues and baffles, the sulfurous fumes and gases are but partially arrested or rendered innocuous by them.

The object of this invention then is to utilize these sulfurous fumes and the contained heat, and to render them harmless to all forms of life.

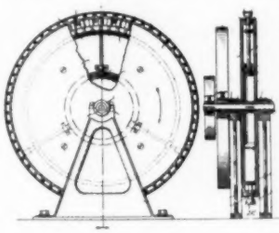
Another object is to provide an effective and inexpensive method of recovering metals from ores containing them.

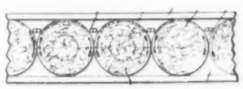
The patent covers:

The process of recovering zinc from an acid sulfite solution which consists in electrolyzing the solution, partially neutralizing with a reagent that can partially neutralize the acid that may be formed and continuously electrolyzing for the recovery of the zinc and elimination of the SO_2 gas.

1,161,412. November 23, 1915. **Method for Buffing and Polishing and Removing Scratches.** Enos Porter, Shelbyville, Indiana.

It is the object of the present invention to provide a machine, as shown in cut, for buffing and polishing and removing scatches rapidly and efficiently at any desired point, particularly on glass, without producing hair lines on the polished surface.

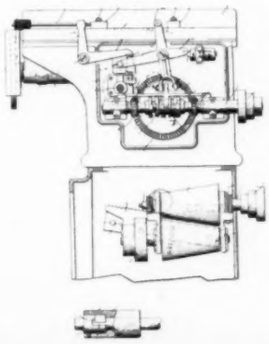




In carrying out the invention there is provided a moving member which carries a series of rotating members, alternate ones of which rotate in opposite directions, and mount on the faces of these rotating members some suitable buffing material. The glass or other material to be buffed or polished or to have scratches removed from it is held in the path of these rotating members so that as the moving member moves the rotating members are brought successively into engagement with the glass at the desired place so that the buffing material can act thereon. The rotation of alternate rotating buffing members in opposite directions effectively does the work, and prevents the formation of hair line scratches on the glass surface. Preferably the moving member is a wheel mounted to rotate, and the buffing members are arranged around the periphery of this wheel with their axes on radii of the wheel.

1,162,832. December 7, 1915. **Grinding Machine.** O. S. Walker, Worcester, Mass. Assignor to O. S. Walker Company, of the same place.

The present invention relates to grinding machines and has particular reference to a machine adapted for the grinding of relatively extended surfaces, such as the faces of disks, or annular metallic plates. It is the general practice to impart to such work a rotative movement, in order to bring all portions of its surface into contact with the rotating abrasive element, or grinding wheel, the latter being mounted so as to have a traversing movement toward and from the axis of rotation of the work in order that all portions of the surface may be acted upon, with the result that the path of action of the abrasive element on the face of the

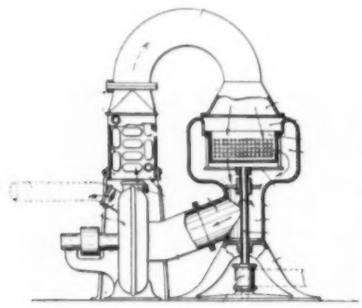


work takes the form of a spiral, as will be readily understood.

The present invention aims to overcome the defects in existing machines of this class, by the elimination of the practical difficulties above enumerated; its objects are embodied in the production of a machine, as shown in cut, having a uniform abrading action with respect to all portions of the surface of the work, thereby securing a ground surface of absolute uniformity, and also the production of a machine of this character capable of operating at all times at the utmost limit of its efficiency, thereby shortening appreciably the time required to grind a surface of a given area, over other machines previously used for such work.

1,163,205. December 7, 1915. **Apparatus for Drying Jewelry and the Like.** F. P. Boland, Providence, R. I.

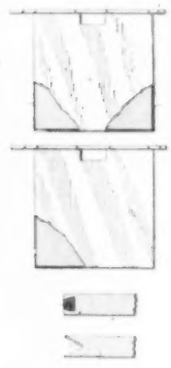
This invention relates to improved process and means for drying wet or moist articles of jewelry and the like in a continuous manner.



In carrying out the present invention the inventor employs a perforated, revolubly mounted vessel, as shown in cut, containing the articles to be subjected to the drying operation, the vessel being inclosed within a practically air-tight, hollow casing, in open communication with the intake side of a revoluble exhaust fan, which latter in turn acts to draw or suck moisture-absorbent medium, as hot air, through or between the articles under treatment, the thus moisture-charged moving air at substantially the same instant being exhausted into and passing through a heating chamber to evaporate the moisture and re-heat the air, the latter being accompanied by outer or fresh air to replace the air lost by leakage, etc. This additional air mingled with the said used air is also heated in its passage through the heating chamber and conducted from the latter into the said container holding the articles being acted upon.

1,163,337. December 7, 1915. **Production of Cathode-Forming Sheets.** E. A. Guggenheim, New York, N. Y.

The present invention relates to the electrolytic production of cathode starting sheets and particularly to the cathode blank, as shown in cut, employed in the production of the starting sheets.



The present invention entirely avoids the difficulties hereinbefore encountered. Its main characteristic feature is that it wholly eliminates the production of scrap. It permits the entire sheet of metal deposited upon both surfaces of the blank to be stripped therefrom, without the aid of highly skilled workmen, and it obviates the labor, cost, and delays incident to the stripping of the scrap and its subsequent reutilization. Furthermore, it lengthens the durability of the blanks themselves, by reason of the readiness with which they are stripped and the moderate vicissitudes of wear and possibility of injury during the stripping operation.

The patent covers:

A cathode blank for cathode-forming sheets, provided in its peripheral edges with a groove or depression filled with insulating material; substantially as described.

A cathode blank for cathode-forming sheets, provided along its edge periphery with a groove, the groove at the side edges being undercut and having a filling of insulating material; substantially as described.

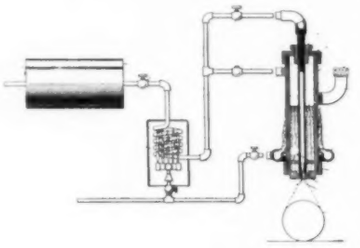
1,163,813. December 14, 1915. **Process for the Hardening of Compositions of Nickel and Copper.** P. J. A. Douglass, Dartmouth, Nova Scotia, Canada.

This invention relates to alloys of the nickel-copper group, and the objects of the invention are to produce an alloy of this class that is sufficiently hard and at the same time tough and supple, to be useful in the manufacture of edged tools, and generally to replace steel in such cases as require metal parts capable of maintaining a cutting edge without being liable to corrosion by moisture, or even salt water.

The invention consists essentially of an alloy of substantially two parts of nickel and one part of copper, having small quantities of ferro-silicon and chromium added and incorporated. The quantities that have been found to produce the most successful results are as follows: Sixty-seven parts (by weight) of nickel, thirty-three parts (by weight) of copper, five to fifteen parts (by weight) of ferro-silicon, two to eight parts by weight of chromium. Ferro silicon may be easily obtained as a commercial article and the proportions of silicon in it is from 45 to 55 per cent.

1,164,008. December 14, 1915. **Metal Spraying Process.** Ralph W. E. Moore, of Swissvale, Pa., assignor to Westinghouse Electric and Manufacturing Company, a corporation of Pennsylvania.

This invention relates to processes and apparatus for producing metal coatings or films, and it has special reference to the production of such coatings by means of a spraying process.



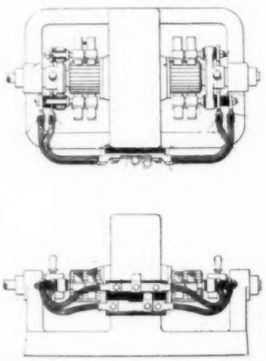
The object of the invention is to provide a simple and commercial process whereby coatings of the above-indicated character may be effectively and cheaply applied either to metallic or non-metallic bodies.

In recent years, there has been an increasing demand for a commercial and economical method of coating various bodies with thin metallic films for protection against weather conditions and acid fumes, for soldering and ornamental purposes, and for purposes of electrical conductivity.

According to the present invention, the inventor produces thin coatings of metal by mechanically sub-dividing and disintegrating the metal in a molten state, as shown in cut, and projecting the disassociated particles at a high velocity upon the bodies to be coated, by means of a spraying process.

1,164,734. December 21, 1915. **Electro-plating Generator.** D. McDermid, Irvington, N. J.

The object of this invention is to provide double commutator electroplating generators, as shown in cut, with devices to conveniently permit the generators to be arranged for either delivering the total output at approximately 6 volts or to deliver the total output at approximately 12 volts, or to divide the output so that it may be delivered in part at 6 volts and in part at 12 volts.



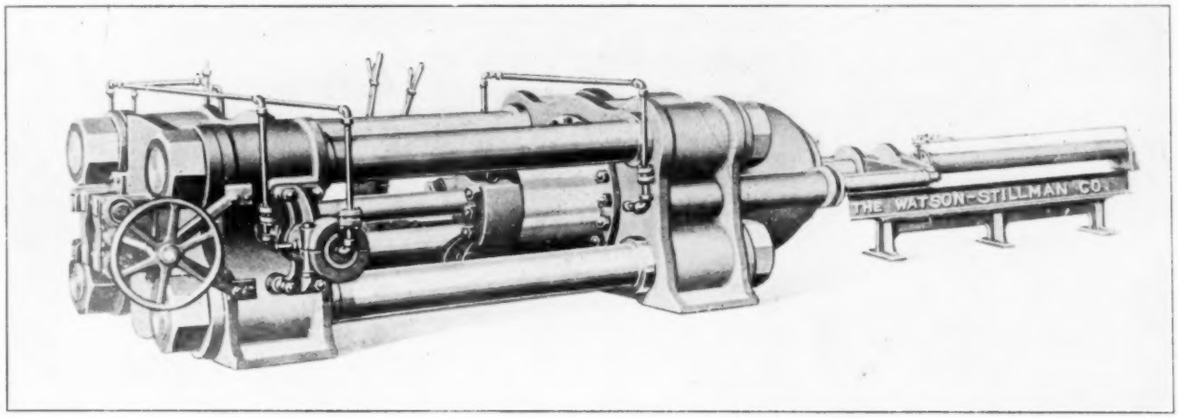
Another object of the invention is to accomplish the foregoing results efficiently in an improved manner and to eliminate the difficulty usually experienced in manipulating the heavy cables which are used as armature leads in this type of generator; and also to make it possible for electroplating generators to be manufactured and placed in stock, ready for sale, either to fill a demand for 6 volt or 12 volt machines.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST.

EXTRUDING MACHINES

The manufacture of rods, rod-shapes, angles, tees, etc., by rolls or by drawing through dies, is familiar to most everyone dealing in non-ferrous metals. But the production of these forms and shapes by the extrusion method, in which the heated billet or slug is pushed, not drawn, through dies by hydraulic pressure, has many features of unusual interest, both in the construction of the press, manner of operation, and the uniformity and density of the texture of the finished product.

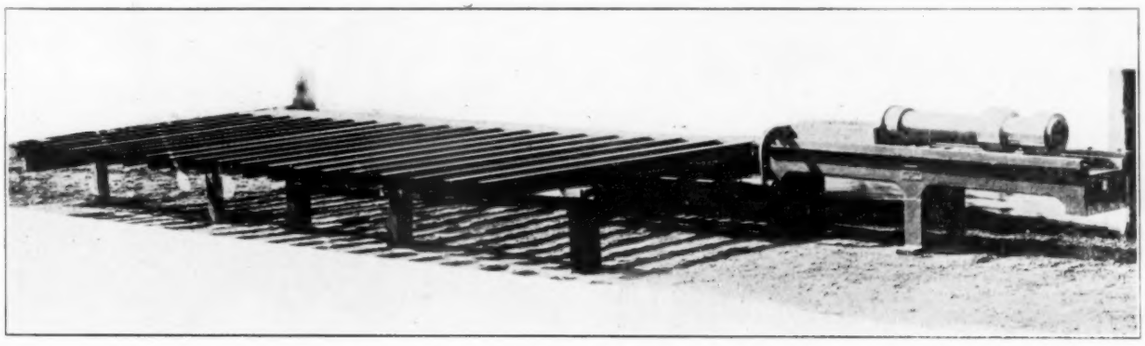


WATSON-STILLMAN EXTRUDING MACHINE.

The machine illustrated herewith is one of the line of the Watson-Stillman Company, 196 Fulton street, New York, designed to extrude copper, brass, aluminum, alloys, or any non-ferrous metal, and has a capacity of approximately 850 cubic inches of metal per stroke of ram. By referring to the illustration, it will be seen that the press consists essentially of a main cylinder and plunger, a die holder or platen, and a billet container. A hot-bed for receiving and straightening the rods is shown in Fig. 2.

The operation of the press is as follows: The billet container is preheated and then attached to the platen by male and female connections, so that the metal cannot escape, except through the dies. A hot slug or billet is then transferred to the slug carrier, which is in line with the billet container. The billet is then pushed out of the slug carrier into the billet container by a rod running through the main ram and operated by an air cylinder, shown at the back end of the press. This rod is then withdrawn and the plunger, which is made of a special steel to resist the heat and take the full 2,000 tons pressure exerted on the ram, is dropped in front and becomes a part of the ram. Pressure is then applied to the main ram, which forces the plunger into the billet container, thus forcing the metal out of the container through the dies and onto the hot-bed. The dies are then cleared and the plunger pulled back by means of pull-back cylinders, shown at either side of the main cylinder, and is ready for a new billet. The movements of the rams are governed by a set of specially designed operating valves which are controlled by pilot valves at the side of the press.

The press has a capacity of 2,000 tons pressure on the plunger, and works at 5,000 pounds operating pressure from either accumulator or direct pump line. The overall dimensions of the press, without the hot-bed, are 30 feet in length, 12 feet in width,



HOT TABLE USED WITH EXTRUDING MACHINE.

and 6 feet in height; the length of the hot-bed and runway is 40 feet, making the total length of the assembled machine 70 feet.

"SAL-HYDE" ELECTRO PLATING SALTS

The W. Green Electric Company, 81 Nassau street, New York, have put on the market the "Sal-Hyde" prepared electro-plating salts which are put up in dry form for gold, silver, platinum, copper, bronze, zinc and brass plating. These salts are ready for use when dissolved in water and are claimed to produce under all conditions of temperature exactly the same results as any ordinary solution. They are distinct from the many so-called plating preparations often sold at low prices, as they produce a true electro-plated finish instead of merely a gilt or color. "Sal-

Hyde" plating salts are put up in bottles containing sufficient material for making up solutions of from one quart to two gallons, or more, and can be obtained in all shades, for all finishes.

The company has a demonstrating outfit at its office, 81 Nassau street, New York, where they will be pleased to show these salts to prospective users.

This company also makes portable buffing motors, plating and lighting dynamos, especially the smaller sizes, and other equipment for plating and polishing. Their pamphlet "S-H" will be sent on request.

A NEW PROCESS OF DIE-CASTING BRONZES AND COPPER BASE ALLOYS

The demand for rapid economical production of finished machine parts has brought about the necessity of eliminating as much machine work upon materials as possible. The process of casting metals in permanent cast iron or steel molds, has been a natural development resulting from this demand. Because of the many difficulties involved, the process has, until very recently, been limited to the production of small intricate machine parts where the requirements for strength, toughness and resiliency are not severe. This process utilizes the so-called white metals, alloys of aluminum, zinc, tin, lead, and small quantities of copper, melting at comparatively low temperatures, and having low tensile strength and resiliency. The white metal die-castings have served an excellent purpose in eliminating machine work,

A GROUP OF A. M. P. CO. PRODUCTS.

making possible the production of parts with clean, smooth surfaces, sharp edges and with accuracy to within .002 inch.

The American Metal Products Company, of Milwaukee, Wis., have recently announced the production of "AMPCO" Bronze Die-Castings, which are claimed to be superior to steel castings in strength, tenacity, elasticity, hardness, and durability. This company say they have succeeded in producing a series of copper base alloys having remarkable properties which render possible the production of finished machine parts in permanent steel die-molds, to an accuracy of within .003 inch to .005 inch. The success attained by this company is said to be the result of persistent systematic research and experimental work carried on by its metallurgists and engineers, for a period of three and one-half years, following many costly and discouraging failures.

The alloys developed by the American Metal Products Company for the production of its die-castings are known to the trade as "AMPCO" Bronzes. They are produced in several grades, having different degrees of remarkable properties which render them adaptable to a wide variety of uses where they can be supplied to meet all sorts of special conditions.

Physical and chemical tests of the different grades of "AMPCO" Bronzes show the following characteristics:

Tensile strength, 50,000 to 100,000 pounds per square inch.
Yield point, 25,000 to 43,000 pounds per square inch.
Elongation, 50 to 6 per cent.
Reduction of area, 35 to 2 per cent.
Brinnell hardness, 70 to 260.
Weight, 15 to 20 per cent. less than that of Phosphor Bronze.
Color, bright golden yellow.

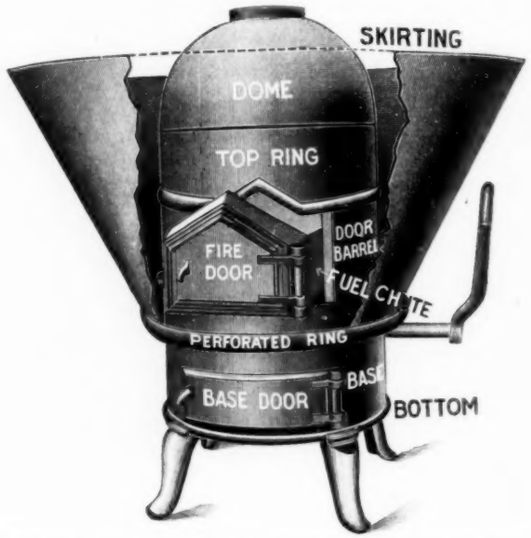
Non-corrodible against acids and alkalis and various salt solutions—malleable and ductile at low red heat.

The alloys contain no zinc, tin, lead or phosphorus, and are essentially 90 per cent. copper-base alloys. A remarkable special grade of "AMPCO" Bronze, developed for use in hydraulic turbines, is said to show a tensile strength in a sand cast test bar of 84,500 pounds per square inch; yield point of 36,000 pounds; elongation of 24.5 per cent., and a reduction of area of 24 per cent.

The company sends out for advertising purposes a small die-cast chisel. This chisel, although apparently a "brass" chisel, will readily cut cold rolled steel and wrought iron, both as a chisel and a lathe tool. Tests of the action of superheated steam upon this metal has shown it to resist the erosive action of superheated steam better than manganese steel. The bronzes further possess a natural temper or springiness not due to any mechanical treatment, which cannot be removed by any process of annealing. The illustration shows a number of die-castings produced by this company and are now in use.

SAND DRYING STOVE

The stove shown in the cut is manufactured by the Indiana Foundry Company, of Indiana, Pa., and is known as the Sutton sand dryer for railroad and industrial plants and others. The stove is operated by hard or soft coal, coke or wood, and the operation, as may be seen from the illustration, is extremely simple. The wet sand is shoveled into the hopper, or skirting, and as it dries runs through the holes in the ring at the bottom. The amount of sand that the stove will dry depends upon two



INDIANA FOUNDRY COMPANY'S SAND DRYING STOVE.

factors: how wet the sand is, and the condition of the fire in the stove.

The specifications for these dryers are as follows:

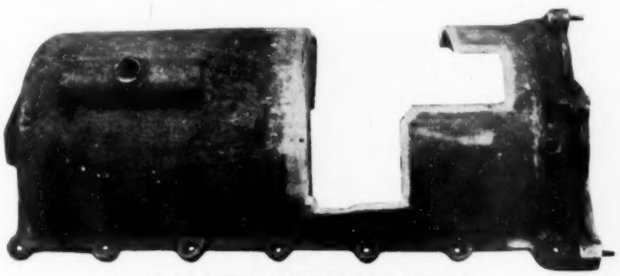
		No. 1	No. 2	No. 3
Extreme height of sand dryers	inches	58	49½	48¾
Height from base to top	"	48	40	38¼
Height of legs	"	10	10	10
Size of firedoor	"	10x12	10x12	11x11
Inside diameter	"	23	17	15
Grate diameter	"	22	15	12½
Skirting at top, diameter	"	52	40	39
Distance from inside firedoor to back of stove	"	33	27	23¼
Thickness of castings	"	1¼	⅞	¾
Approximate capacity, cubic feet of sand		18½	8½	7½

WORKING ALUMINUM AT 400 DEGREES FAHR.

By E. O. Lawrence.

For a long time laboratory work has been conducted in this country and abroad with the object of working out some method of handling aluminum repairs at the lower temperatures possible with most other metals in common use in structural work. Owing to the fact that many of the characteristics of aluminum are similar to those of copper, the logical method of procedure has seemed to be the invention of some type of solder which, in the hands of the ordinary operator, would be able to perform work that would give uniformly satisfactory results.

As a result of this seemingly evident fact there have been hundreds of aluminum solders placed upon the market, many of which have been fairly satisfactory in the hands of expert users, and none of which have been successful enough to displace welding by oxy-acetylene or other high temperature methods. The results attained by these solders varied widely. At one

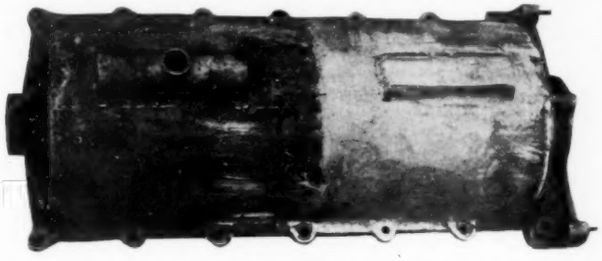


A BROKEN ALUMINUM CASTING.

time, due to care and a combination of advantageous circumstances, an excellent repair job would be made, and on the very next occasion, for no apparent reason, the solder would fail.

Oxidization has been the stumbling block over which most of the soldering operations have fallen, and most of the remainder have failed due to the poor physical or chemical characteristics of the soldering material. Aluminum, when exposed to the air, oxidizes *instantly*. It does not take three seconds or two seconds for the oxide film to form, but it is there *immediately*. The result is that when the solder is applied it only has a grip upon the oxide film, which readily peels off under the slightest stress.

The accompanying before-and-after photographs show a job which was done by the aid of a metal composition and a gasoline torch. A job of this same sort has been done recently on one of the Porter-Knight cars entered for the Sheepshead Bay race.



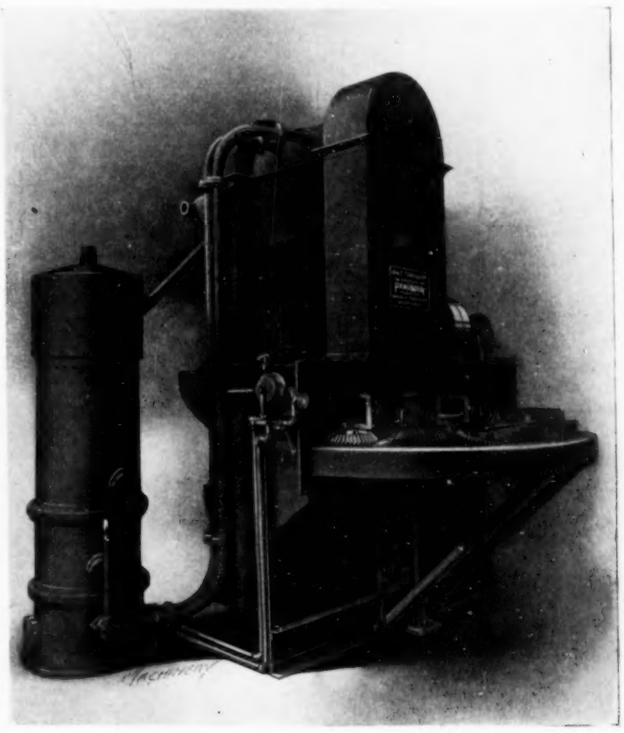
THE SAME CASTING AS ABOVE MENDED BY THE WELDUM PROCESS.

and has proven eminently satisfactory. It is a sort of compromise between a welding and soldering operation. The material is built up as in welding, but the temperatures are no higher than in the average soldering operation. The material used on the Porter-Knight racing car and on the crankcase shown in the accompanying illustrations is Weldum, a product made by the Weldum company, of 25 West Forty-second street, New York City. It is a combination of metals and salts, of metals having a tensile strength and rigidity about double those of aluminum. The result is that when a repair is made with it the built up part is stronger than that of the original piece.

The oxidization trouble is avoided in two ways. The material itself incorporates a fluxing agent which allows the Weldum to penetrate below the oxide film, and again in its application the operator scrapes the aluminum through the molten Weldum. The latter is a kink which would help even with most of the aluminum solders. This material has been used abroad for a number of years, and at least before the present war, was regularly manufactured in Berlin, Germany. The price of the metal is $3.50 per pound, in this country, and the manufacturers claim that by its use any repair work can be done on aluminum sheet metal or castings at one-fourth the price of the usual high-temperature welding process, neglecting even the first cost of the apparatus necessary for the latter.

TABLE SAND BLAST

Table sand blasts, as shown in cut, are primarily for medium and small castings that cannot be desirably handled in the barrel sand blast and where it is not wanted to do them with hose sand blast. The castings are laid on the table and no breakage can possibly result to the most fragile pieces. The blasting compartment is back of a series of rubber curtains and completely enclosed so that no sand or dust can get outside. The rotating nozzles are at a slight angle and pass over the



PANGBORN TABLE SAND BLAST.

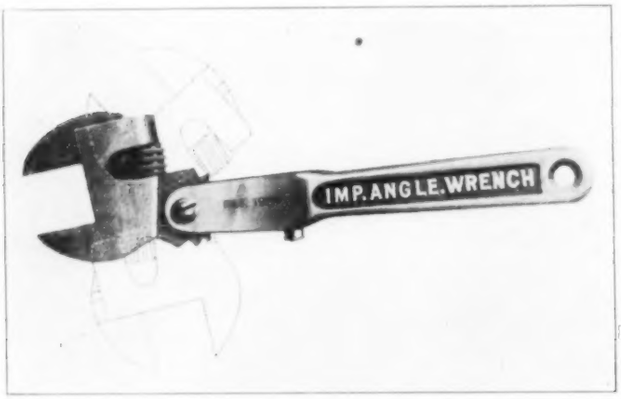
entire surface of the table. The non-enlarging nozzle inlet saves a lot of air. The sand is automatically returned to the sand blast with the refuse thoroughly removed. The multi-chamber sand blast refills without interrupting the blasting. All moving parts are enclosed for their protection and for safety to the operator. Every part of the equipment is made extra heavy of the proper character of material to insure safety and durability when high pressure air is used. The controls are centralized and conveniently located.

The equipment shown is of the direct pressure "Pangborn" design and is manufactured by the Pangborn Corporation, Hagerstown, Md., and is guaranteed to turn out more work at less cost of operation and maintenance than any other make.

The following are a few users of the pressure rotary table sand blast: Packard Motor Car Company, International Harvester Company, Aurora Automatic Machinery Company, William M. Crane Company, American Hardware Corporation, St. Louis Malleable Casting Company, General Electric Company, Buick Motor Company, Timken Detroit Axle Company, Harley-Davidson Motor Company, Duffy-Trowbridge Stove Company and Union Manufacturing Company.

ADJUSTABLE ANGLE WRENCH

The Imperial Tool Company, of Bloomington, Illinois, have recently brought out an adjustable handle angle wrench. This wrench incorporates a number of advantageous features. The adjustable jaw will take any tap up to 1¼ inch at eight different angles, or the tap can be turned in very close quarters by ratcheting the handle one or more notches at a time in either direction, by simply pressing the ratchet button. When the button is released, the handle is locked rigidly.



ADJUSTABLE ANGLE WRENCH.

This wrench will take the place of many different sizes, styles and types of wrenches. It is easily operated in positions and angles where no other wrench can be used. It is not a novelty wrench. It is a practical tool—made of the very best material, and will stand the hardest use. Its great adaptability will find a ready place for it in auto kits, garages, machine shops and innumerable places where a high grade and all-purpose wrench is desired. It is made and guaranteed by the Imperial Tool Company, Bloomington, Illinois, manufacturers of high grade wrenches.

COMPOSITIONS

The Chas. F. L'Hommedieu & Sons Company, Chicago, Ill., have recently placed on the market a polishing composition known as Nubian Lime, for which they claim high merit.

The Nubian Lime Finish is put up in tin cans, air tight, weighing about two pounds. This can is easily opened at top or bottom by key which goes with each can and contents of can is guaranteed against slacking. The company claims that their

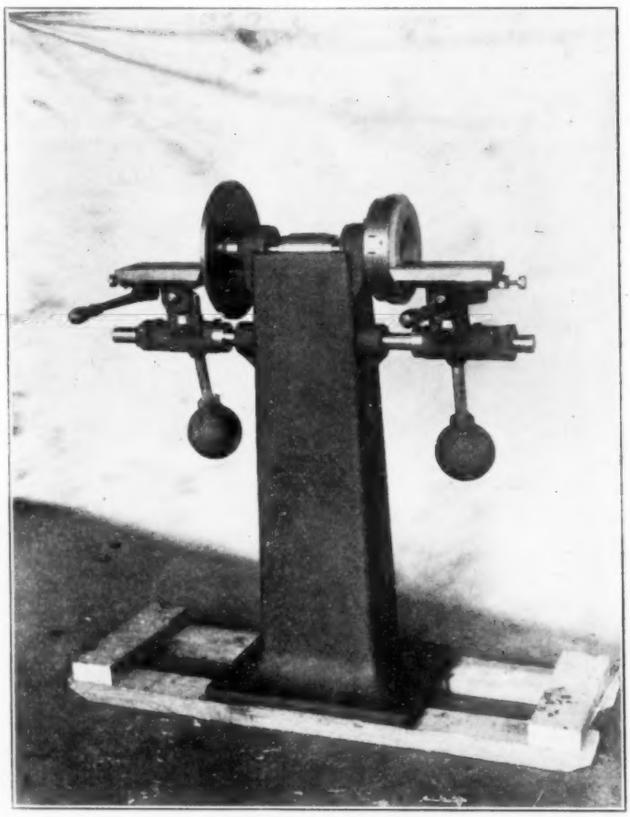
NUBIAN LIME AND BLACK DIAMOND POLISHING COMPOUNDS.

Nubian Lime Finish gives a higher lustre or color than any other lime finish and will not slack rapidly after the can has been opened. They also have another new composition called Black Diamond, which gives a high color, although not as high a finish as the Nubian Lime Finish, but equal to many lime compositions.

Sample cakes will be sent to anyone upon application, but in applying for sample, state class of work upon which sample is to be tried.

A NEW GARDNER GRINDER

The Gardner Machine Company, Beloit, Wis., has recently brought out a grinding equipment which is proving particularly useful in art metal shops and, in fact, any plant where manufacturing of a rather light nature is conducted. The machine, as shown in illustration, is called the No. 1 Gardner Grinder. It consists in the main of a rigid cast iron base carrying a 1 9/16-inch diameter crucible steel spindle mounted in radial and thrust ball bearings. The left end of spindle carries a 12-inch diameter by ½-inch steel disc wheel, and the right end is fitted with an 8-inch "Perfection" ring wheel chuck, holding an 8" by 3" by 5" abrasive ring wheel. The chuck and the disc wheel are interchangeable. It should be mentioned that abrasive cloth discs of any grade number can be attached to both the front and back side of the steel disc wheel. When one disc is worn out, the wheel is reversed and the other disc used. A wheel press is furnished for attaching these abrasive discs to the steel disc wheel.



GARDNER NEW GRINDER.

A 1½-inch diameter rockershaft is located a little way down through the base and supports a universal lever feed table on each end. The work to be surfaced is placed on top, the work backed up with an angle plate or some suitable fixture and by means of lever, forced against the grinding wheel, being rocked back and forth at the same time. A micrometer stop screw enables the operator to produce duplicate parts automatically and very rapidly. It will be observed that this machine will accommodate two operators, making large outputs possible. Different types of work table and grinding wheels can be furnished, all of which are interchangeable. The equipment includes, in addition to the above mentioned parts, either a plain or ball-bearing countershaft and an extra assortment of abrasive discs, cement, etc. It can also be supplied in direct connected motor-driven type.

TWENTY-SEVEN PAGES ON FURNACES

The twenty-seven page advertisement published in this issue by the Monarch Engineering and Manufacturing Company, 1206 American Building, Baltimore, Md., to the best of our knowledge, contains the largest number of pages ever used by one advertiser in any one issue of any trade journal. It is intended to describe the Monarch line of furnaces, core ovens, etc., so completely that prospective buyers may safely order any of these popular and successful furnaces direct from the advertisement by mail or telegraph without loss of time.

PAASCHE AIR BRUSH EQUIPMENT

In using the air brush to apply a coat of enamel, lacquer or other liquid material to finish surfaces of metal or wood, it is absolutely necessary that moisture be absent. In order to produce an efficient and satisfactory apparatus for the drying of the air and material used in such spraying operations, the Paasche Air Brush Company, of Chicago, Ill., has spent considerable time and money in experimenting.

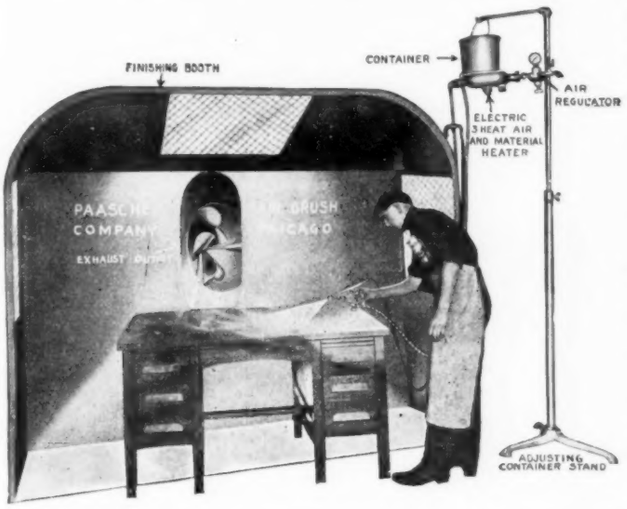


FIG. 1.—SHOWING THE METHOD OF USING THE PAASCHE AIR BRUSH OUTFIT.

The device shown in the accompanying cut is now being offered to the trade by the company, with the guarantee that it will adequately answer the required purpose. The attaching of a heating device to the spray hand-piece of a liquid or varnish sprayer was thoroughly tested out and was found to be a failure on account of the high temperature which causes the hand-piece to become too hot to handle, and, furthermore, makes it difficult and troublesome to keep in the best of working condition, so the heater shown here is claimed to obviate all of the disadvantages of the former device and is claimed to be practically perfect.

The manufacturers also claim that the Paasche electric material and air combination heater thoroughly produces more heat than is required, and by the aid of the three heat switch is controlled to furnish the right heat required for the various materials and air pressures. It only requires one-half of what an ordinary light uses and is easily attached to any air line, light or power circuit. It is guaranteed not to burn out, to entirely eliminate pitted or pebbled effects, to aid in flowing of the materials, producing a polished plate glass effect, as well as aids in the drying processes.

Another important part of Paasche equipment is the hood and ventilating outfit as shown in the cut, Fig. 1. This hood has been especially designed to give perfect ventilation with the least resistance, reducing power cost, meeting the most severe and difficult handling of work from the more common to the most artistic treatments of coated, painted or finished surfaces. They are made from galvanized sheet metal, 22-foot gauge rigidly braced with angle irons; metal floor is included with each booth. All sizes are made in standard height—7 feet. They are furnished in any widths or depths required for the special purposes they are to be used. The inside of the hoods are smooth, without ribs or flanges, making cleaning very easy.

LUMEN BEARING COMPANY

The picture shown below represents the present plant of the Lumen Bearing Company, brass founders, Buffalo, N. Y. The melting capacity of this plant is about 50,000 pounds of the alloys used in brass and bronze castings. On a basis of something less than 50 per cent. yield in good castings, this means 20,000 to 25,000 pounds of castings shipped per day.

They are about to install a new melting feature, which as far as they know has not been used by the trade and which will double the melting capacity if followed to the final conclusion. They will, of course, be limited in this direction by their molding area, but will, at the same time have available a quantity of crucible made ingot. In the ingot capacity, as it stands at present, is 15,000 pounds per day, all made in crucibles, this quantity not being included in the metal designed for casting from which, as noted above, they expect to obtain a large surplus.

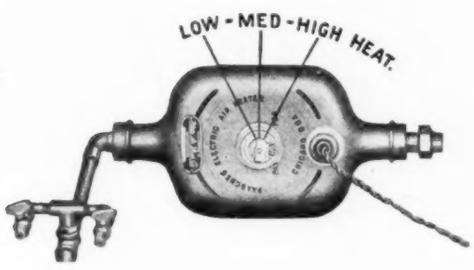


FIG. 2.—THE PAASCHE AIR AND MATERIAL HEATER

VIEW OF LUMEN BEARING COMPANY'S PLANT AT BUFFALO, N. Y.

The company has recently issued a number of booklets that are devoted to the various special metals and alloys which they have attained particular efficiency in the manufacture of. These booklets are devoted to the following alloys: Machine bronze, a compound used for machinery construction and repair, and consists of a list of bushings which are carried in stock in a number of sizes and cored bars. Bronzes and babbitts are described in a twenty-four page booklet, and cover a complete line of bronze, brass and aluminum alloys which are claimed to be standard for various requirements. Babbitt metals are also the subject of a separate booklet and the babbitts listed therein are arranged in the order of their tin contents and complete information is given concerning each grade described.

Other booklets are Oil Grooves—Fitting Up Bearings, Bushings—A Proper Driving Fit, Ideal Bearings for Gas Engines, Lumen Bronze Die Castings, Lumen Bronze Bearings, High Tensile Strength Bronze, Ideal Trolley Wheels, Machine Tool and Machinery Bronzes, Lesoyl (A Graphite Compound), Listed of Bearing Patterns.

The personnel of the organization is as follows: William H. Barr, president; C. H. Bierbaum, vice-president; N. K. B. Patch, secretary; H. P. Parrock, manager, and L. S. Jones, sales manager.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS.

AMERICAN INSTITUTE OF METALS

President, Jesse L. Jones, Pittsburgh, Pa. Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 106 Morris avenue, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The 1916 convention will be held in Cleveland, Ohio.

President Jones and Secretary Corse report that:

"The record of the American Institute of Metals during the year 1915 has been very gratifying. Its membership at the present time is—and its finances are—in excellent shape. The ninth annual meeting, held at Atlantic City, September 28 to October 1, 1915, was very well attended; many interesting papers were presented, and their extended and intelligent discussions promises to render the annual Volume of Proceedings for 1915 larger and more valuable to manufacturers and metallurgists than any of the preceding volumes.

"An examination of the Geographical distribution of the members of the Institute shows them to be widely scattered over the United States, with a number of members in Canada and foreign countries. There is, however, a marked increase in the membership in the larger cities and manufacturing centers, and this feature of the growth of the Institute gives promise of soon rendering possible the realization of the valuable suggestion made in the editorial column of the METAL INDUSTRY of October, 1915; viz., That the growth and usefulness of the American Institute of Metals could be greatly advanced by the establishment of local sections.

"The live technical societies of today are characterized by a desire for mutual helpfullness and a spirit of active co-operation. With these ends in view the American Institute of Metals has fostered the formation of an Advisory Committee in co-operation with the Bureau of Standards, the American Chemical Society, American Institute of Mining Engineers, American Society for Testing Material, American Electro Chemical Society being the other societies represented. This committee held two well-attended meetings at Washington, D. C., on April 3, 1915, and November 19, 1915. Among the many activities of this committee may be mentioned the following; The preparation of standard white metal samples; standard methods for the analysis

THE COLISEUM, CLEVELAND, OHIO, WHERE THE 1916 EXHIBITION OF FOUNDRY APPARATUS AND SUPPLIES WILL BE HELD UNDER THE AUSPICES OF THE ALLIED FOUNDRY ASSOCIATIONS.

of white metals; the cause and prevention of season cracking; a study of the molding sands of various localities in the United States; an accurate determination of the physical constants of the more generally used alloys; a standard method for the determination of elastic limit and a standard system for the nomenclature of alloys.

"The close and harmonious relations that have existed in the past years between the American Institute of Metals and the American Foundrymen's Association are a matter of congratulation to both societies and a harbinger of greater fields of usefulness for both in the future. The annual meetings of these two societies will be held jointly in 1916, and the meeting place will be Cleveland, Ohio. As the annual Exhibition, which takes place at the time of these meetings is to be directly under the management of the American Foundrymen's Association in the future, it is confidently expected that an unusually large number of exhibitors in non-ferrous lines will be present and that this will attract many executive and technical men from the non-ferrous industries to the meeting.

"The American Institute of Metals has already selected its Program Committee for 1916. This committee will be in charge of G. H. Clamer, of the Ajax Metal Company, which is a guarantee that the papers will be both numerous and interesting to all brass and non-ferrous men."

AMERICAN SOCIETY FOR TESTING MATERIALS

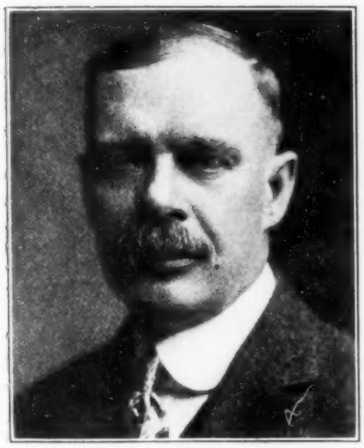
Secretary Edgar Marburg says:

"The consistent growth of membership in the society at the average rate of 130 per annum has been well-maintained notwithstanding recent action by which the membership dues were increased fifty per cent. The present membership of the society is 1950, which represents an increase of 110 members for the past six months.

"Within recent years various regulations have been adopted towards greater conservatism and fuller publicity, in advance of final action in the adoption of standards. An important further change in that direction by which proposed new standards, or the amendment of existing standards can no longer be referred by vote at the annual meeting to immediate letter ballot of the society is the provision for their publication in the Year-Book for one year with a view of inviting written criticisms and discussions addressed to the appropriate committee, and as a basis for their recommendations and action at the next annual meeting.

"The 1915 Year-Book, which is devoted to the standards of the society in their latest revised form, contains 88 standards and 22 tentative standards, as against 70 and 3 respectively in the 1914

NEW OFFICERS OF THE AMERICAN INSTITUTE OF METALS FOR 1916.

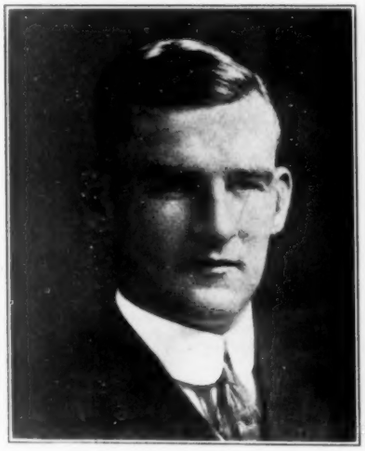


JESSE L. JONES, President.

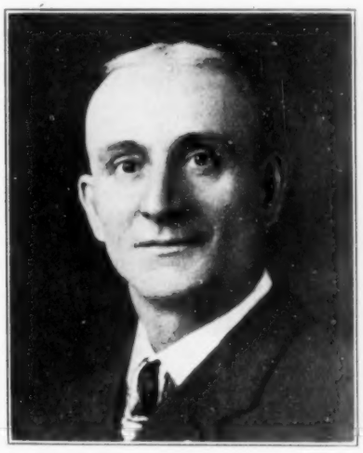
W. M. CORSE, Secretary and Treasurer.

D. B. BROWNE, Vice-President.

G. W. GULICK, Vice-President.



W. B. PRICE, Vice-President.



F. H. SCHUTZ, Vice-President.

Year-Book, the number of pages having been increased from 500 to 757.

"The widespread and constantly increasing influence of the activities of the society may be judged from the following excerpt from the last annual report of the Executive Committee:

"The increasing use of the standard specifications of the society in Federal, State and Municipal circles, apart from their extensive adoption in ordinary commercial channels, is significant of the confidence placed in the work of the society and serves to emphasize the reciprocal obligation upon the society to justify that confidence in connection with everything to which its name is attached. It may not be known to the membership at large, for example, that the purchases for the Panama Canal have been made largely under its standards, 27 of the standard specifications of the society being now in use by the purchasing department of the Canal; also that the United States postal cars are purchased subject to the A. S. T. M. standard specifications. Again, nine of the standard specifications have been adopted—in some cases with slight modifications—in connection with the Boiler Code recently prepared by a committee of the American Society of Mechanical Engineers, which is expected to be adopted in many States by legal enactment. Similarly, in the current revision of the Building Code of the City of New York, seven standards of the society are referred to in some such form as the following: 'Except as may be otherwise prescribed by the rules of the Superintendent of Buildings * * * shall conform to the standard specifications of the American Society for Testing Materials for * * *.'"

AMERICAN ELECTRO-PLATERS' SOCIETY

Secretary Walter Fraine reports a gross increase in membership of ten per cent. for the year of 1915. This percentage of increase, though less than that of the two preceding years, is gratifying in view of the changed industrial and financial conditions brought about by the European war. One new branch of the society was organized in Toledo, Ohio, and branches have been under consideration in Hartford, Conn.; Grand Rapids, Mich.; South Bend, Ind., and Louisville, Ky. It is expected that at least three of these will be organized in time to be represented at the next convention, which will be held at Toronto, Canada, between the first and tenth of July, 1916. The exact date for this event will be set by the Toronto branch.

All of the branch societies except one show an increase of membership and the financial condition of the branches and that of the Supreme Society is satisfactory, especially when present conditions are considered. The educational work of the society is proceeding along the same lines as in the past two years. Classes in elementary and advanced chemistry and physics have been organized in various branches. Those branches having laboratories report definite progress in working out some of the difficult problems which have been under discussion.

*The great event of the year was the annual meeting and convention, held at the National Cash Register factory, Dayton, Ohio, June 3-5, 1915. An ideal convention setting, splendid exhibits and valuable papers and discussions, created enthusiasm and held the interest of the delegates and visitors from start to finish of the most profitable convention in the society's history. The 1916 convention, at Toronto, Canada, for which the Toronto branch is making extensive plans and preparation, promises to equal if not exceed, that of 1915.

New York Branch.—In reference to the annual banquet of this society which was announced in THE METAL INDUSTRY for December and which is to be held February 19, 1916, at 8 p. m. at the Broadway Central Hotel, Broadway near 4th street, New York, N. Y., W. J. Schneider, chairman of the banquet committee has prepared the following announcement directed to manufacturers interested in the deposition and finishing of metals.

"You are all cordially invited to attend the annual banquet together with your managers, superintendents, formen platers and chemists. An especially attractive program has been prepared for this occasion. The United States Government has taken sufficient interest in the doings of the American Electro Platers' Society to agree to send Dr. Blum, an expert of the Bureau of Standards, Washington, D. C., to give an address on the Standardization of Electro Plating Solutions and the Methods Used by the Bureau of Standards.

"Other well-known speakers who will give addresses are Dr. H. S. Lukens, instructor of electro-chemistry, University of Pennsylvania, Philadelphia, Pa., Dr. W. App Jones, of the Celluloid Zapon Company, New York, N. Y., and others not yet decided upon.

"Space has been reserved at the hotel for those of the manufacturers and dealers of platers' supplies and equipment who might wish to exhibit their products and literature concerning the same and a small fee of $10 will be charged to help defray expenses. It is earnestly desired that a large number will take advantage of this opportunity and will send in applications for space accompanied with the fee as mentioned above, and thus insure the reservation."

Applications for space should be addressed to W. J. Schneider, Chairman of the Banquet Committee, Broadway Central Hotel, New York N. Y. Tickets for the banquet at $1.50 each can be had from Wm. Fischer, secretary, 345 East Twenty-third street, New York City. A reception committee will be on hand from 9 a. m. to take care of visitors to the exhibit, etc.

Cleveland Branch—Charles Werft, secretary, 331 Strathmore avenue, Cleveland, Ohio.

The meeting place of the Cleveland Branch has been changed from the Y. M. C. A. to the American House N. W. of the Public Square.

St. Louis Branch—This branch will hold their third annual banquet at the American Annex, on January 22, 1916. This year it has been decided to extend an invitation, not only to the members and their employers, but to their families and friends also.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

Commissioner Webster states that during the past year this association held its four quarterly meetings, at the first of which that section of its membership which supplies goods to the jobbing trade exclusively, evolved a plan of reporting sales, which has been a great benefit, and we believe worked with satisfaction alike to the manufacturer and the customer. It is a modified form of a plan generally used in other lines, in which the seller keeps the members fully informed with up-to-date and reliable information.

At the recent meeting, the members reported plenty of sales and lots of inquiries, but the general disposition was owing to the fact that copper and all metals are advancing, to go slowly, proceed cautiously and not book a lot or order for future delivery, in the belief that within the next four or five months, the man who is able to make deliveries will get the business rather than the man who makes the price now.

The large producers estimate that fifty million pounds of copper have been sold in the last week, so it would seem if the manufacturers will be patient and not become excited or swerve in judgment by quotations that they hear somebody else has made, or of the consummation of a deal that some concern may have made, but sit tight, keep their hand upon the throttle valve of good judgment, not be over anxious to get rid of goods, though they may be made up and on the shelf, but patiently wait for a short time, they will come out the best in the long run.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

Charles S. Hildreth, general manager, reports that the National Machine Tool Builders' Association held the usual semi-annual convention at Atlantic City, N. J., last May, and the annual convention in New York City in October. Nothing out of the ordinary has been undertaken during this year. All of the members having been very busy and had very little time to attend to association work. No new plans are proposed for this coming year, but as usual will hold the two conventions and hope to have programs of the same general interest and profit to members as have been the custom of the past.

*Described in THE METAL INDUSTRY, June, 1915.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST.

A TRIO OF THE METAL INDUSTRY AUTHORS, SERIES III

COLONEL J. H. HANSJOSTEN

While the features of the man shown in the accompanying photograph may not be familiar to all of our readers, he is, however, well known for his interesting articles and also his prominent connection with the American Electro-Platers' Society, of which he is a past supreme president.

J. H. HANSJOSTEN.

Colonel Hansjosten, and he is a real Colonel at that, having served three years in the First Regiment, Michigan Infantry, is a prolific writer, and while he has not figured very often in the past few years as an author in THE METAL INDUSTRY, we have great hopes that in the future he may be induced to put some more of his varied experiences on paper for the benefit of our readers.

From February, 1890, the Colonel has been engaged in a varied number of occupations, for instance, he spent twelve years or more in the stove factories and job plating shops of Detroit, while he at the same time was mixed up in politics, holding office as supervisor of Wayne County, city assessor of Detroit and alderman of the ward in which he lived. Among the concerns that Colonel Hansjosten has been connected with for the past twelve years, since he gave up public life, are the Detroit Register Company, Detroit, Mich.; Rock Island Stove Company, Rock Island, Ill., and the Automatic Electric Company of Chicago, Ill. At the present time Colonel Hansjosten may be found as the advertising manager of Bennett-O'Connell Company, Chicago, Ill., and for success in this position, for which he is particularly well fitted by virtue of his long and varied experience among platers and metal finishers, he has the best wishes of a host of friends.

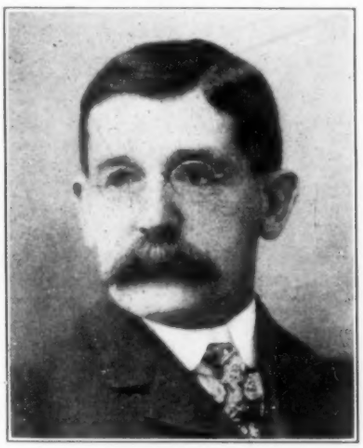
JONATHAN BARTLEY

Jonathan Bartley was born in a little northern New Jersey hamlet called Bartley and which was named after his grandfather, who founded the place. After passing his early boyhood days in the "country village school," he was placed in a private school to fit him for entrance to the Chester Collegiate Institute, at that time considered one of the best schools in the country.

Graduating from that school at an early age, and not caring to go further at that time in study, being mechanically inclined, he decided to go for a time with his father, who was the best flour mill builder in the East. Soon after this the father went into other business, and Jonathan was left to fill out the contracts that had been made. After the contracts were completed he became manager of a large lumber and coal yard and spent two years in this line, leaving when the Keystone Chemical Company of Philadelphia, Pa., offered what appeared to be better opportunities.

Shortly after this he associated himself with the graphite and crucible business. After entering this field he began to hunt for something that had been written on the crucible subject, but nowhere could he find a line that threw any light, and it was only after he began his bombardment on the "Abuse" of crucibles that any enlightenment was ever given to the crucible salesmen.

In addition to a number of other articles, Mr. Bartley wrote a specially interesting one which started in January, 1915, entitled, "My Reminiscences of the Crucible Business During the Past Quarter Century," and which proved to be highly interesting, for as we all know, Mr. Bartley usually "calls a spade a spade."



JONATHAN BARTLEY.

As Mr. Bartley is now engaged in a business which involves the use of graphite, viz.: the manufacture of graphite lubricants and products we can expect some more articles written in his well known trenchant style.

C. W. COOK

C. W. Cook, who has favored THE METAL INDUSTRY from time to time with articles on the manufacture of knives, forks and spoons, was born in Westfield, Conn., and his early education was obtained in Prospect, Conn., where he lived until he was nine years old. Two years later, or when he was eleven years old, he went with his parents to Yalesville, Conn., and began his first experience in the flatware manufacture at the Charles Parker Company plant.

C. W. COOK.

Mr. Cook's days at that time appear to have been twenty-four hours long, for, in addition to his attending school and working at his house, he worked at the factory, not only in the daytime, but also at night, when he and his brother acted as watchmen for the plant. At the end of three years of this twenty-four-hour schedule he had stopped going to school and put in full time at the factory. Under the able management of his superintendent he became efficient in the mechanical part of the business in all its details, together with ability to make and use all the tools used in the manufacture of flatware. Mr. Cook's experience in the silver manufacturing business has been confined to comparatively few concerns when one considers that he has been connected with the industry for forty-six years, and the circle of his activities has been confined to the state of Connecticut, as we find him first at Yalesville, then in Derby, from there to Bridgeport and then to Wallingford, back to Bridgeport and back again to Wallingford, where he is at the present time as general superintendent of the Simeon S. and George H. Rogers Company, of Hartford and Wallingford, Conn., in the manufacture of flatware both in plated and nickel goods.

Wylie Brown, who recently resigned as secretary and sales manager of the Bridgeport Brass Company, Bridgeport, Conn., is now connected with the North American Copper Company, New York, N. Y.

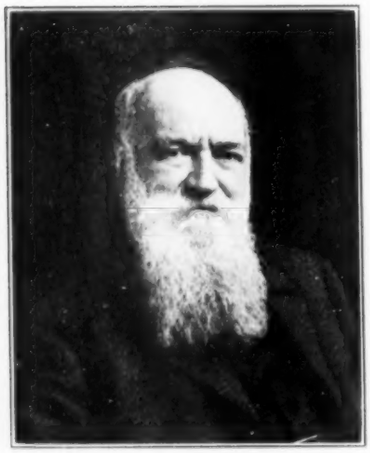
J. T. Tolland, superintendent of Jenkins Brothers, Ltd., manufacturers of valves, etc., Montreal, Canada, has resigned and has accepted the position of general manager of the Montreal Foundry and Machine Company of the same city. H. Smith has taken Mr. Tolland's place as superintendent of Jenkins Brothers.

G. E. Moreland is now superintendent of the galvanizing and bolt and nut departments of the Southern California Iron and Steel Company, Los Angeles, Cal. This concern is credited with having the largest and best equipped bolt and nut works west of Chicago. Mr. Moreland in sending in his subscription to THE METAL INDUSTRY for 1916 says: "I have taken the paper so long that now I could not do without it. It is almost three years since I left the Westinghouse Electric and Manufacturing Company at Pittsburgh, Pa., and I keep posted on current matters by consulting THE METAL INDUSTRY. With best wishes for another successful year."

William H. Carpenter, superintendent Bristol Brass Company, Bristol, Conn., has resigned after 33 years' service. He has been succeeded by John F. Wade, formerly superintendent of the New Departure Manufacturing Company. Mr. Carpenter is now assistant manager of the Mayo Radiator Company of New Haven, Conn.

DEATHS

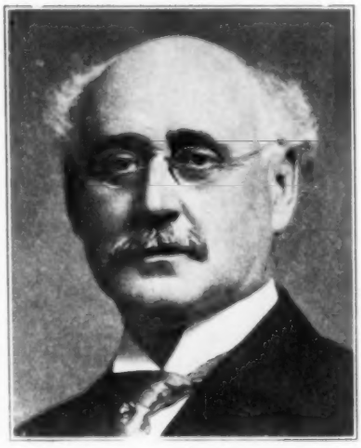
GEORGE E. SOMERS



GEORGE E. SOMERS.

George E. Somers, vice-president Bridgeport Brass Company and president Bridgeport Crucible Company, Bridgeport, Conn., died December 18, aged 82 years. He was born in Newtown, Conn., and began his business career in Waterbury. Thirty-five years ago he removed to Bridgeport and purchased an interest in the Bridgeport Brass Company, becoming its general manager, a position he held for many years. He was active in organizing the Bridgeport Crucible Company and was its president up to the time of his death. He was prominent in the political affairs as well as in the business circles of his home city.

WILLIAM A. CONNER



WILLIAM A. CONNER.

William Andrew Conner, of Plainfield, N. J., died suddenly December 6, at his office in Perth Amboy, N. J. He was born in Baltimore, September 12, 1859, and began his business career in 1876 in Pittsburgh, in the oil refining business, in which he reached the position of assistant manager for the Standard Oil Company. In 1885 he took charge of the first plant built by the Standard Underground Cable Company, which manufactured copper wire and cables, of Canada, Limited in Hamilton, Canada, and from then to the time of his death he was the head of the manufacturing business of that company; including large plants planned and built by him in Pittsburgh, Pa.; Perth Amboy, N. J.; Oakland, Cal., and Hamilton, Canada. He was a director for ten years and first vice-president since 1909. He was vice-president of the Perth Amboy Trust Company, in whose inception he had an active part.

He was a cousin of E. J. Waring of the Standard Underground Cable Company, and of the late Richard S. Waring, founder of the company and the inventor of "Waring" cables.

THOMAS WALLACE

Thomas Wallace, founder of Wallace & Sons, of Ansonia, Conn., and for the last fifteen years managing director of the Waclark Wire Company, of New York, died on January 1 at his home, 346 West Seventy-first street, New York, in his eighty-ninth year.

He was born in Manchester, England, and at the age of five came to this country with his parents on the sailing vessel *New York*. In 1839 his father established a wire mill at Annsville, N. Y., and in 1841 removed to Derby, Conn. In 1848, with his brothers and father, Mr. Wallace founded the firm of Wallace & Co., one of the first to make copper wire in this country. He was the first to introduce the continuous wire machinery for drawing fine brass and copper wire, a process which revolutionized the industry. Mr. Wallace is survived by his wife, four sons and four daughters.

L. M. BRIGHAM

L. M. Brigham, sales manager of the brass goods department of Manning, Maxwell & Moore, Inc., New York, died December 11, at his home in East Orange, N. J., after a long illness, which did not, however, incapacitate him from business until recently. He was 42 years old and had been with Manning, Maxwell & Moore for twenty-two years, and for the last five years was a director of the company. He was secretary of the Ashcroft Manufacturing Company, United Injector Company and Consolidated Safety Valve Company, all subsidiaries of the corporation. Mr. Brigham possessed great ambition and energy, qualities with which were combined affable traits that constantly added to his circle of friends. He was a member of the Engineers' Club of New York. He leaves a widow and one child.

JOSEPH KISSAM

Joseph Kissam, one of the best-known salesmen in the brass trade, died in New York on December 24, 1915. Mr. Kissam had been connected with the Bridgeport Brass Company, Bridgeport, Conn., which was founded by his brother, as salesman for upwards of thirty years, but retired from active business life in 1912.

George F. Sinclair, secretary and treasurer of the Grand Rapids Brass Company, Grand Rapids, Mich., since its organization in 1888, died December 7.

John T. Langan, general manager of the Jordan L. Mott Company, Trenton, N. J., died January 3, after an illness of two weeks. He was a native of New York and had been associated with the Mott company for the past twenty-seven years. He is survived by his wife.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS.

WATERBURY, CONN.

JANUARY 10, 1916.

There never was a more prosperous season in the history of Naugatuck valley metal industries than that which marked the last quarter of 1915, but there are some indications that even better records for industrial expansion and financial independence will be hung up by manufacturers hereabouts during the present year. As a result of the flood of business for the brass makers there is said to have been an increase of 8,000 in the population of Waterbury during 1915, which means an increase of about ten cent. There have been about $2,000,000 worth of new buildings erected by manufacturers and probably $1,000,000 more has been put into brand new machinery in just two or three of the larger plants, but the most eloquent evidence of the remarkable flood of prosperity came during the last three months of the year. This took various forms. One was the payment of three extra dividends of five per cent. each by the Scovill Manufacturing Company, each of the three last months of the year. Another was the payment of extraordinary bonuses to salaried employes, foremen and workmen just before Christmas. Another was the award of a special Christmas bonus of about ten per cent. of the amount of the employe's salary about December 10. Money was never more plentiful in the ranks of the factory employes, never more plentiful in the savings banks of the city. Neither was labor of all kinds ever more scarce since about 1840 when Waterbury was little more than a village.

It was "war orders," so-called, that brought Waterbury out of the gloomy hole that it had begun to sink into as a consequence of the setback in business generally following the passage of the present tariff act. The boom did not affect all of the industries of the city. It went first to the machinery makers and created a remarkable advance in business for the Waterbury Farrel Foundry & Machine Company, the Manville Machine Company and the smaller machinery builders. These concerns had to bring back to work every man that had been given a vacation, and soon they were searching the country over for first class machinists. Curiously their reputation for efficiency seems to have been the sole reason for their capture of this business. Hence, they had slight advantage over other machinery makers in the labor market, for they were the first to appear there in search for skilled men in a dull season. The orders they were filling were from domestic and foreign manufacturers.

The Scovill Manufacturing Company began to boom along in its machinery department soon after. The orders were from American, German and English manufacturers. The machinery brought up the business of small concerns throughout the entire Naugatuck valley, and expert labor became scarce. The American Brass Company began to find its various branches filling up to capacity; likewise the Chase Metal Works and the Blake & Johnson Company and the Berbecker & Rowland Company and others, and the first quarter of the year found every large factory in the city except the Waterbury Clock Company humming along on practically full time and almost with their full complement of help. Still domestic business was away below normal levels, and it was only because of the demand for special products that kept full time schedules in operation in many of the small brass factories and foundries.

With the approach of summer there was a noticeable migration of factory hands towards Waterbury. The machinery builders had been the advance guard of hunters for skilled labor. From Meriden, Hartford, Springfield, Providence, Boston, New York, New Haven, western New York state towns, from all parts of the north and middle west men with some training in brass and copper industries came to Waterbury. There were none to be had from the other brass manufacturing towns of this section, for Ansonia, Torrington, Seymour and Winsted were themselves beginning to import men to man their brass shops and their machine shops. Labor agitators came also, for throughout the country the word had passed that these were boom times in the Naugatuck valley. The agitators saw their opportunity and made plans to strengthen unionism's forces.

It was by sending out leaders, or organizers, that the union forces began their campaign. They put these men in charge with authority to recruit existing unions or to institute new unions and to study local conditions. In Waterbury they began to talk to the older men about the exceptional offers made to get help in larger cities. The men began to inquire and found some apparent foundation for the talk of the organizers. They became restless and they joined the new unions. They felt that if they had to work with men who were somewhat dependent on their assistance for their ability to hold their jobs, even though they were brought in from larger cities on promise of wages higher than those paid the older hands, they were entitled also to any higher scale that the scarcity of labor seemed to warrant. They might have waited a little and avoided much unpleasantness, but not all workmen have the necessary imagination to have faith in their employers invariably. So it happened that union demands for better pay, better hours and better conditions began to be formulated and presented.

Then the Waterbury spirit showed itself. Up in Torrington, and in some of the other brass making plants of the valley there had been some trouble previously. Men in the hardest worked departments were growing stale and restless because of the steady grind to which they had not yet adjusted their habits of living. These upsets were generally promptly settled. The American Brass Company seems to have had the first of them and it seems also to have been invariably successful in readjusting matters so that peace was promptly restored and the objections of the men fairly met.

First in Waterbury to be hit by the union demands were the machine shops and the foundries. But the strike failed, not at once, or flatly, but so dishearteningly that the men had a lesson. Superintendent P. F. Bannon, of the Waterbury Farrel Foundry & Machine Company, went from room to room the day that the strike was to be declared and talked plainly to the men. Then they were left to decide for themselves. Less than half the force that was expected to strike did so. Later the big plants of the Scovill Manufacturing Company and the Chase Metal Works, in Waterville, were hit. Just as the blow was to be delivered by the unions the wages of the entire force were advanced ten per cent. and the fifty-hour week put into effect without cutting pay. Piece wages were adjusted to meet the change in hours and soon the situation cleared.

The strike fever subsided. The organizers had their accounts audited and moved on, concluding that their work was done. Joseph Ettor and his confreres were forbidden the right to deliver their discourses on the principles of the I. W. W., and Ettor was arrested and ordered out of town. Socialist street meetings were forbidden and only the Salvation Army now holds forth in the open air. The authorities agreed with the manufacturers that the least said the better, so they put their silencers on all outdoor agitators. Workmen were left to think only about their work and their chances to make more pay, and they soon found that that was enough. The Saturday half-holiday, too, was a concession they had hardly hoped to obtain so quickly.

For the first ten months of the year the flood of business was due almost wholly to war business. Domestic business was "picking up," but it was slack and unsteady. Tube-

making was especially profitable, and the great plant of the Chase Metal Works, in Waterville, just completed, was not only manned to full capacity but soon found to be too small for unprecedented demands of the times. With orders enough on its books about the first of March, 1915, to keep this plant running full time for over two years, the company immediately began to make extensions to the Waterville plant, and it is still extending it. The Scovill Manufacturing Company began buying up all the private property around its plant. It paid the market prices and took immediate possession and began clearing the ground for new factory buildings, although it had just completed an era of expansion which gave it a capacity of 5,500 hands. It will soon have new buildings completed which will give it a capacity of 11,000 hands, and the end is not in sight. The American Brass Company was forced to speed to completion the work on several extensions to its property in Torrington and Waterbury in order to meet the demand for greater capacity, and as fast as they were completed the big new factory buildings were equipped and manned. Its local forces were practically doubled, while in Ansonia and Seymour great additions were made. Torrington has experienced almost as great a boom, proportionately, as Waterbury in the "A. B. C." plants.

It was due to the high grade of the products of the Waterbury plants that the war order business continued to grow so rapidly. From the first the materials and the workmanship on such goods as go into the production of munitions has been most satisfactory, and the percentage which failed to pass the inspection of the governments to whom they were delivered has been almost negligible. Only the efficiency of the manufacturing plants and the skill of the workmen, who for generations have been improving the manufacture of brass and copper in Naugatuck valley plants can account for this. Step after step in the progress of brass making here has been so thoroughly mastered and improved upon that in such extraordinary times as those of 1915 it is still possible to turn out a maximum volume without sacrificing anything in quality. This, too, has been accomplished in spite of the high price of spelter, which forced the installation of some marked changes in management to prevent unnecessary waste of materials and the steady advance of copper.

Because of the rush war business the larger plants were able to keep their help busy by readjusting the work of various departments, particularly those which were affected by the low volume of domestic business. Smaller plants, however, found themselves running full time early in the year with domestic orders. Some of these were due to the sudden development of aeroplane manufacturing in New York state and the middle west; others were due to the splendid growth of the American automobile industry. Concerns like the Pilling Brass Company found business ever expanding. Its best seller for months was a very thin sheet brass which was especially in demand among automobile manufacturers. Novelty makers began to get increasing orders early in the year, and by the end of the summer were hard up for help, although offering high wages. The condition continues.

In the clock industry, business was dull owing to the cutting off of the supply of crystals bought in Europe. Before the war the Waterbury Clock Company started a plant to make crystals here and it is nearly completed. Further extensions are also planned by that company, to be made at once, apparently in anticipation of a boom in business at the cessation of the war. The plant of the defunct New England Watch Company, which was bought up by R. H. Ingersoll & Brother, is producing certain small wares demanded by machinery makers, and while its new watch-making equipment is being prepared it is keeping a capacity force busy on such orders.

Everyone was too busy at the Christmas season to encourage the usual vacation periods, and even the clock shop hands were given less time off than in other years. Business prospects have so improved since November 1, when domestic orders of all kinds began to increase in volume, that there is probably no factory in the Naugatuck valley today which is not assured of steady running practically at capacity, if not better, for most of the new year.

With the increased volume of business came many minor troubles. It became necessary to make improvements in the handling of freight, and the great volumes of goods that have been sent out of Waterbury for points north, west and south have been handled admirably. The manufacturers have co-operated splendidly with the New Haven railroad and high efficiency has been maintained thereby. Incoming shipments have been somewhat unsatisfactory in the past few weeks owing principally to the congestion of freight on coal-carrying roads west and south of New York and the embargo restrictions, but there is no great anxiety felt yet. At the same time there is no discounting of the importance of relieving the serious conditions around New York promptly. Private fire and police forces have been created at the larger factories and these now exceed in numbers the city departments.

During the year it is estimated that the value of new buildings for which permits were issued was a little under $2,000,000. There were permits during the year for about fifty factory buildings of all kinds, most of these obtained by the American Brass, the Scovill and the Chase concerns. The Waterbury Manufacturing Company, Waterbury Clock Company, Waterbury Farrel Foundry & Machine Company also have undertaken large extensions.

Dwelling houses have not increased in proportion to factory buildings, and there has been a consequent advance in rents which is beginning to give the manufacturers some concern. The Waterbury Tool Company, which is removing to Brown's flats, this city, from New Britain, has just begun the erection of nine new dwellings near its new site for the accommodation of employes. The city is so overcrowded that in some of the boarding houses the health authorities found that the night workers were obliged to sleep on beds only just vacated by the day workers. Scores of families have had to store their goods in warehouses because of the lack of vacant tenements.

Thus 1916 begins with prosperity at flood tide and prospects of its early fall are dim, but the high price of copper, the freight congestion outside of this field and the confusion that seems due to the mobilization of all American industries to meet the new demands of the period are producing big and little problems that are bound to tax the ingenuity and power of the industrial captains more heavily than ever before.—F. B. F.

HARTFORD, CONN.

JANUARY 10, 1916.

Never before in the history of Hartford have the local factories been as busy as they are with the advent of the new year. Interviews with the officials of the leading factories of the city show that the shops are operating full time, overtime, in double shifts and both night and day in their endeavors to meet the demands of numerous big orders, many of which can be traced to the European War. They predict that the prospect of a continuation of the period of prosperity for a number of years is assured. Not a single factory in the city is operating on a schedule less than full time. Thousands of extra hands have been added in the different shops and a notable shortage of skilled mechanics has developed in the past few weeks. The conditions at present tell the story of the year which has just passed. It has been a year of progress.

At the beginning of the year 1915, it was seen that Hartford factories were slowly emerging from a serious business depression, which extended through the greater part of the year 1914. Business had just begun to strike a stride above the normal when a period of strikes began. The employees of the Capewell Horse Nail Company broke the ice on May 28, when 300 of them walked out.

The largest of the strikes resulting from the eight-hour propoganda was that at the Pratt & Whitney Manufacturing Company, about 1,500 of whose employees walked out on September 29. It was preceded by two smaller strikes.

On September 7, sixty-five operatives of the Atlantic Screw Company walked out, asking for an eight-hour day, and, on September 8, thirty-five polishers at the Colt's Patent Fire Arms Company went on strike, making similar demands. Then, on October 28, 200 employees of the Hart & Hegeman Company, thirty employees of the Taylor & Fenn Company and a like number of employees of the Rhodes Manufacturing Company went on strike.

On October 30, 230 employees of the Arrow-Electric Company walked out, and on November 1, forty employees of the Jewell Belting Company followed suit. Two days later, the Billings & Spencer Company lost 138 of its men. Forty-two hands employed at the Underwood Typewriter Company participated in the final walkout. With the exception of the Capewell Horse Nail Company and the Underwood Typewriter Company employees, all of the strikers walked out as a result of the refusal of their employers to grant them an eight-hour day.

But, although the strikes may have impeded, to a certain extent, the progress of metal industries in Hartford, the fact that over 11,000 persons are employed in the eleven factories affected, today, as against 9,945 on September 1, would indicate that the factories in this city have not only held their own, but have forged ahead despite the obstacles in their path. During the year, there has been an increase of 3,000 hands in the number employed in Hartford shops, the total being estimated now at 21,000.

During the year, the local manufacturing concerns have expanded considerably. The Whitney Manufacturing Company has built a large addition to its plant on Bartholomew avenue, the Hartford Machine Screw Company has erected a five-story addition to its regular plant on Capitol avenue, the Jacobs Manufacturing Company has put up a new and modern factory building on Park street, the Pratt & Whitney Manufacturing Company has taken over the Pope West Works, thereby gaining at least 1,000,000 square feet of floor space; the Asa S. Cook Company has put up a new shop on Franklin avenue, the Hartford Special Machine Company has provided commodious quarters for itself on Homestead avenue, the Billings & Spencer Company has bought the plant abandoned by the former Columbia Motor Car Company, the Sterling Blower Company has acquired the buildings on Windsor street, formerly occupied by the Hartford Foundry Company and the Colt Patent Fire Arms Company has been obliged, on account of gigantic war orders, to force four companies out of its west armory in order that it might avail itself of the increased floor space of about 50,000 square feet.

In September the A. S. K. Ball Bearing Company of Gottenborg, Sweden, filed in the Secretary of State's office papers of the incorporation of a Hartford branch. It is capitalized for $2,000,000, and will employ 400 hands. Since then, the company has bought land on New Park avenue and is contemplating the erection of a large factory there.

The Billings & Spencer Company took out a permit December 28, to build a $10,000 factory building on Park street, near Laurel street. It will be two stories high.

The demand for increased facilities for storage have led a group of Hartford manufacturers, representing the interests of the Hartford Machine Screw Company, the Whitney Manufacturing Company; the Hartford Rubber Works, the Taylor & Fenn Company, the Pratt & Whitney Company, the Sigourney Tool Company, the Underwood Typewriter Company and the Hart & Hegeman Manufacturing Company to buy the old plant of the Billings & Spencer Company, at the corner of Russ and Lawrence streets, for $150,000.

The property occupies the southern part of the block between Lawrence & Broad streets and the land, 400 by 200 feet, is on Russ street. There are ten buildings on the lot, including two three-story buildings and a two-story factory building. There is estimated to be about a quarter million feet of floor space.

Estimates made at the end of last month by prominent officials have it that, in the past ten weeks, approximately 2,500 people employed in Hartford factories, have gone on strike. They have lost in wages over $150,000 and the loss to manufacturers has been the same.—T. C. W.

NEW BRITAIN, CONN.

JANUARY 10, 1916.

Glancing back over the year 1915, which has drawn to a close, it appears that the twelve months just passed have been the most unusual in New Britain manufacturing circles of any since the organization of the great manufacturing concerns here. With the opening of the new year last January business was not far from a stand still. Factories were working on part time, and in many instances workmen had been laid off. Orders were not coming in fast enough to encourage business men and things indeed looked bad. During the months of February and March business seemed to brighten up somewhat, but there was no appreciable boom which affected the city in general. With the coming of April and the advent of spring, however, things began to look much brighter. Salesmen seemed to come into their own again. Sales managers were made happy by the receipt of larger orders from the employes on the road and some of the factories began to hire in new hands. The next step was an increase in working hours. Then it was that the big boom really came. The effect of the war began to be felt here. The drain of the war had exhausted the products of European manufacturers and purchasers had to look to the United States for products, and when hardware products were needed it was to New Britain that the buyers looked. The era of prosperity about the country resulting from large war orders aided local concerns for building activities increased, hence the orders here increased.

The next step in the line of prosperity came when local concerns began to get larger war orders themselves. The North & Judd Manufacturing Company was one of the first to feel the benefit of this. Enormous orders were received for cavalry and saddlery accoutrements for the equipment of the British army. When the *Lusitania* went to the bottom it carried with it a goodly portion of the stock made by this factory, and consequently the orders had to be duplicated. For a long period of time his concern operated a night and day shift. The New Britain Machine Company next profited by the war. Large contracts from concerns manufacturing munitions were received, and this concern to was forced to operate a night and day shift and the profits earned were said to have been enormous. Then other concerns about the city began to receive orders auxiliary to munition manufacturing concerns, and it seemed that the city had launched into an unprecedented era of prosperity.

All through the summer months business interests folded their arms and smiled complacently as the shekels came rolling in. But in the meantime a spirit of unrest and dissatisfaction was brewing among many of the employes of the various concerns. The storm burst in September when all of the machinists at the New Britain Machine Company went on a strike, demanding more pay and shorter hours. Quickly following, employes at the Corbin Screw Corporation merged with the strikers until at one time almost the entire plant was out. Foundrymen and other employes at the North & Judd Manufacturing Company rapidly followed suit, and in other concerns various departments were also affected until the city was in the grip of the worst labor strike in its history. Trouble broke out among the strikers and several bad riots occurred. After about a month, however, various settlements were made and the men returned to their respective places of employment, and since then all has seemed harmonious until December 28, when 200 molders at the North & Judd Manufacturing Company again went on a strike and are still out at this writing. This strike is, however, a minor one, as the trouble has arisen over the discharge of a single employe rather than over demands for more pay or better hours. Thus, as 1915 takes its place in history it may be readily seen that New Britain has passed through a most unusual period, but today the manufacturing concerns are again rushed with work and prosperity is once more the keynote.

Just how much the various concerns have benefited may be judged from the fact that at the last quarterly meetings several concerns have granted extra dividends in addition to their usual dividends. The New Britain Machine Company has granted a regular dividend of two and one-half per cent. and an extra dividend of a like amount. The Union Manufacturing Company has declared an extra dividend of six per cent. and has also voted to give the employes a bonus. Business at the Stanley Works is booming and at the Landers, Frary & Clark Company the same is true, while at the Russell & Erwin division of the American Hardware Corporation an order has been recently received to equip the new municipal building at Pittsburgh with hardware. At all of the other concerns, business is good and the outlook for 1916 is indeed rosy.—H. R. J.

MERIDEN, CONN.

JANUARY 10, 1916.

The year of 1915 is closing in anything but a satisfactory manner for the manufacturers in Meriden, where tableware, silverware, etc., is a most important product. The closing weeks of the year have been given over to a monster strike which was joined by a large percentage of all the employes in the city. As yet this strike is not settled, although it is reported that as the cold weather increases more men are being compelled to return to their former jobs without having earned a victory.

On December 30 an announcement was made at the factory of the Manning, Bowman & Company, a branch of the International Silver Company, that all employes who remained loyal and did not join the strike now in progress would receive as a New Year's gift an amount equal to two and one-half cents an hour for every hour they have worked since October 4. The office force, with the exception of the high salaried men, will also receive sums proportionate to their incomes.

At the office of the International Silver Company proper, where a strike is still on, it was announced that effective January 1 the shops would go on a new schedule whereby the workmen will receive more pay for fifty-five hours work than they have been getting for sixty hours. Women employes will receive a minimum wage of twelve and one-half cents per hour.

The same schedule and rate of pay, it was stated, will also go into effect at the Manning, Bowman & Company factory on the new year.

These facts should be of much interest to other manufacturers, as the Meriden strike has been one of the biggest and most expensive in the east, and already one disastrous riot has occurred in which a number of shots were exchanged with the police and guards.—H. R. J.

PROVIDENCE, R. I.

JANUARY 10, 1916.

The year 1915 will go down in the industrial history of Rhode Island as one of more than ordinary significance. Starting the year with nearly one-half of the employees of the different establishments of the metal trades out of work, the twelve months closed as one of the most prosperous that has been experienced in many years, if ever, and this, notwithstanding the efforts of professional agitators to precipitate a general strike among metal workers. Incipient labor troubles involved several of the larger plants, but in no instance did success crown the ill-advised action of the employees.

The hard times of a year ago dated back to the period just preceding the outbreak of hostilities in Europe. Many of the small factories were closing for from one to four weeks at a time, and thousands of men were out of employment. Then came the war with its ever increasing demands, and today there is not a metal-working establishment in any line, excepting jewelry, in the State that can secure enough men to take care of the orders that have been pouring into the country since last February.

At the beginning of 1915 the metal trades had at least 50 per cent. of the employees out of work. Machinery of nearly every description is wanted in Europe, and especially those machines which can be used in making war materials and guns. Great quantities of these machines are being shipped to England and France, and some to Italy and Russia every week, and the end is not in sight. In addition, orders from domestic sources are becoming more frequent, and it has been said that the present boom would not show any cessation for at least two years, even though the war ended at once. Foundries, machine tool makers, small tool makers, machinery builders and all allied lines are busy, and many of the plants would be operated day and night if there was a sufficient supply of skilled labor to be had.

Rhode Island manufacturers in all lines are a unit in expressing the opinion that the year 1916 will prove to be the banner year for manufacturing and the general prosperity of the people of this State. Many of them believe that there are some problems facing the industries that should be straightened out before there can be absolute prosperity, and all are agreed that conditions as they are in the country today mean higher prices on nearly every manufactured product. The great demand for goods by the nations of Europe, the difficulties facing the manufacturing plants of New England in securing raw material and fuel and in sending their products to the New York, Western and Southern markets are all taken into consideration by the manufacturers.

At the present time the metal trades hold the centre of the stage, both here and in the whole country. The great demand for war munitions that has come from Europe, as well as the demands that are being made by the railroads and the structural iron interests have caused a great wave of prosperity in the business. Alfred J. Miller, vice-president of the Whitehead Brothers Company, and in charge of the Providence office of the concern, believes that the new year is to be a very good one for the metal trades. He says: "The foundry trade is more active than at any time since 1906, and, affiliated as it is with the iron and steel industry, the prospects for 1916 are exceptionally bright. Many plants are well sold up for months ahead."

William A. Viall, of the Brown & Sharpe Manufacturing Company, states: "It is difficult to make a statement relative to the prospects of the new year, as it seems as though conditions were based upon unknown quantities more than ever before. Should the war continue for a year, there is no doubt but that there would be a great deal of business, and it is a mooted question as to what the conditions would be should the war cease. It looks, however, as though there would be much to do for a period after the close of the war, but this would be modified, I think, by the fact that the warring nations will undoubtedly do all they can to compete with us in our own markets."

The manufacturing jewelry industry was in a very bad condition during the greater portion of the year just closed. At the beginning of the year fully 60 per cent. of the employees in the industry in this city and the Attleboros was out of work, with the prospects looking exceedingly dark. From time to time orders came to a few of the factories, and one or two plants whose owners were wise enough to have secured South American connections previous to this year found a fairly large amount of business in supplying the wants of the countries of Latin America.

Some of the jewelry manufacturers took advantage of the war to turn their plants into munitions plants, with a resultant profit. This course was not open to many of the manufacturers, however, because their presses did not have a drop great enough to turn out the small shells and other material which was needed, and other machinery was at a premium. In addition the price of brass was so high that it was almost impossible to secure needed supplies.

As fall drew near the jewelry business began to reflect the prosperous conditions throughout the country, and many of the plants went on full time, and some of them found overtime work necessary to get out the orders which were received. At present the factories are finding a large amount of business, and the outlook for the industry is much better than it was a year ago.

W. E. Richmond, of the American Emery Wheel Works, has announced that several small additions to the present plant are contemplated. Another story was recently added to the main building, and plans are being completed for a new house to be constructed to hold two kilns. Bernard F. Connors has withdrawn from the Rhode Island Nickel Plating Works, 33 Garnet street.

A dividend, the amount of which is not announced, on the capital stock of the Nicholson File Company is being paid by the treasurer, Paul C. Nicholson, to stockholders.—W. H. M.

ATTLEBORO, MASS.

JANUARY 10, 1916.

Opinions obtained from a number of manufacturers in various lines indicate that the city's industrial year of 1915, when it is summed up later in the official State reports, will be known to be one ahead in total of a few previous years and developing a fall and winter rush that recalled the biggest boom years of the past.

The season in jewelry proved a big one, growing as the holidays neared, and it was an era of high speed to meet rush orders. Few wholesalers seemed to have put in the usual summer stocks, and the consequence was that the beginning of fall found them unprepared.

No one would venture to say, in September, that the chief business of the city would rise from the slough in which it was enveloped. Salesmen went out in preparation for the fall, but their orders were small and their reports not hopeful. Then, suddenly from apparently a clear sky, orders began to rain in.

The most hopeful of the jewelers had been insisting that all the extra wages being spent in the country as a result of war orders would have its effect on the buying, and their prediction proved true. October began to show a quickening, November saw many of the factories returning to night schedules and abolishing Saturday half-holidays, and December proved one mad rush to fill orders.

Some of the silver houses in this section were caught in, according to reports, because they did not make up the customary big stocks last summer. Conditions did not seem to justify the tying up of much capital, with silver at a high price, but when the fall trade began the absence of this stock was keenly felt.

The machine shops of the city have had a big year. At the

Mossberg plant, it was found necessary to deny stories that Canadian rifle parts were being made here, but it was known that the factory was busy enough to call for a night as well as a day gang and that its output was being limited only by the difficulty in securing raw supplies. One big order that impended came to naught because a regular supply of copper for a number of months could not be guaranteed.

All the varied accessory lines to the jewelry trade—and they are many and profitable, felt the good results of the jewelry rush and report an extremely busy year. Some shops developed trade in articles formerly imported; one shop here was rushed to death with a new and exclusive fad of peacock rings and others developed the French art of painting on gold, producing enamel effects that the big city retailers were advertising as imported.

At the start of the year, there were ugly rumors about different concerns and manufacturers found it necessary to take caution against unfounded rumors. The situation worked out better than expected, and there were very few overturns in business, although conditions were made ripe for several reorganizations which promptly took place.

Estimates of the exact amount of improvement for the year over 1914 are easy to obtain but hard to credit. Consult men in the cheaper lines and their stories will run as high as 500 per cent. Some of the gold men were still optimistic up to December but saw no rush in the expensive lines.

Conservative judges trying to view the whole field saw that from 30 to 50 per cent. over 1914 would be fair and justified as an estimate. Others placed it higher than this. It was admitted that a large part of the entire falling off at the beginning of the year was due to the absence of jewelry in the women's fashions for the year. The trade is considering several plans to remedy this, and by next year may have a plan in operation. By this, it is hoped to influence the fashion pages and make jewelry popular.—G. S. McK.

BUFFALO, N. Y.

JANUARY 10, 1916.

The year 1915 was by no means an unwelcome one. Throughout it was one of steady growth. Take the foundries for example, in January they did a fair amount of business; February was dull; in March there was shade of improvement; April a decided increase took place; May was good; June to August a steady increase; September to October was very good; and during the months of November and December they were working about full capacity.

Throughout the year the electroplaters' experience was the same, but the finishing and rolling mills experience was different. They had an unusually good year. January to March was marked with poppet boom orders, but from thence on a brisk trade set in and it prevailed throughout the remaining months of the year. This was the busiest branch of the non-ferrous metal industry in Buffalo.

Prices of metals was a constant source of worry throughout the year. And because of the unsteadiness of metal prices shrewd figuring and business ability had to be brought into play continuously. Some men hesitated before they would take a long term contract, and some refused long term contracts.

Some of the foundries were never so busy in their entire history as they were last year. The National Bronz Foundry moved to larger quarters during the year, and the Unique Brass Foundry is building a new and much larger foundry. The only new foundry to creep into existence during the year was the brass foundry of the Mayer Carburetor Company.

The electroplaters have also done some improving during the year. Take the Washington Plating Works, they have been making addition after addition in leaps and bounds. A. F. Flanders Manufacturing Company enlarged his establishment during the past year.

Now as to the finishing and rolling mills—great and wonderful advances have been made. The rolling mill capacity has increased 150 per cent. during the year. This is due to the large addition made to the Buffalo Brass and Copper Rolling Mill.

From all of this it can be seen that a better margin of profit was made this past year, also that great progress had been made industrially.

Now what of 1916? Little anxiety is expressed about the future. In fact you can feel the even pulse of peace of mind and confidence, enthusiasm and optimism over the coming year. It is common property to say that 1916 will be a marked improvement over 1915.

During the past month a little boom struck this city. Everywhere hair is flying. It was one of the very best months of the year. Every foundry, electroplater, finishing or rolling mill worked full blast and with no signs of lull in the near future. The present indications point to a stronger and more brisk market throughout 1916.

Mr. Fred Schnell, of the Schnell Bronze Bearing Company, Inc., said that last month was one of the biggest months of the year for them. Also, that business has been on the steady increase for the past several months. They look forward to a big year in 1916.

The National Bronze Foundry are booked up with orders to keep them busy for months to come. American Bronze Company wound the year up with a favorable December.

A. F. Flanders Manufacturing Company is working his plant full capacity. George Ray Manufacturing Company had an exceptionally good month. From present indications they expect to do a big business in 1916.

Zero Valve and Bross Company are working their forces night and day in order to get their orders out. Aluminum Casting Company are very busy doing work for a large number of automobile manufacturers.

Titan Copper Products Company had a favorable 1915. At present they are busy with a number of contracts. A. Fries Plating Company has been taxed to their capacity during the past month. The Washington Plating Works contemplates making another addition to their establishment.

The Unique Brass Foundry has been very busy of late doing work for boats. This is unusual, as most of this work never comes in until the early spring. Manager Stewart believes that next year will be one of a steady healthy growth.—G. W. G.

NIAGARA FALLS, N. Y.

JANUARY 10, 1916.

Nineteen fifteen was a good year for the local men. Every line of operation in the non-ferrous metal industry was busy throughout the year, with the exception of the jewelry and silverware manufacturing trade.

The foundries have been working full capacity since July, while the electroplaters have steadily increased their volume of business ever since the first of April. The finishing and stamping mills, etc., trade did a brisk business throughout 1915. The silverware and jewelry manufacturing trade was but fair in March. From April to May it was spotty. June and July developed a better feeling so that by August they were doing a brisk trade. In September there was a drop in business, but in November and December business loomed up as fair. Now the other industries, such as the chemical manufacturers, etc., had an excellent year throughout.

Large additions were made to the following plants during the past year, the Frontier Brass Foundry, Titanium Alloy Manufacturing Company, Carborundum Company, Niagara Electro-Chemical Company, and the Acheson-Graphite Company. So that on a whole the past year was a profitable one and much progress was made.

During the past month another step forward was made. The foundries and some of the miscellaneous industries were working full capacity, while the electroplaters and finishers increased their volume of business very materially.

The year 1916 is expected to be one of the biggest years the Cataract City has seen in years. And the only thing that is apt to mar this coming year from possibly becoming a complete success is the scarcity of labor which is much in evidence at the present time.

The Frontier Brass Foundry and the Titanium Alloy Manufacturing Company had a very busy December. A. Wright, the Spirella Company, and the Carborundum Company also report a very favorable month.—G. W. G.

COLUMBUS, OHIO

JANUARY 10, 1916.

The metal market in Columbus and Ohio territory during the year 1915 was generally speaking good. This is especially true when the adverse business conditions are taken into consideration

and when the scarcity of some metals were considered. On the whole the trade was satisfactory and prospects for the future are unusually good.

The market earlier in the year was slow, due to curtailed consumption in many lines. Prices ranged low and in some cases large discounts were offered in order to force trade. Condition maintained the same until towards the first of August when a turn for the better was recorded. The demand increased as munition factories enlarged, and in fact all metal lines showed improvement. Towards the latter part of the year prices took a sharp turn to higher levels and there was a scarcity of supply. Some of the concerns in Ohio report an increase of approximately 25 per cent. in the business done in 1915 over that of the previous year. Copper and brass continue rather strong after the turn for the better. The same is true of aluminum and prices are far in advance of those earlier in the year. Babbitt and spelter were also in better demand.

At the close of the year all metals were advancing rapidly. This is especially true of brass, copper and aluminum. There was a good demand from all sources and the supply was smaller than usual. Copper took quite a jump in December and crucible shape is now quoted at 21½ cents. Scrap brass, red, was sold at 15½, and yellow brass scrap at 12½ to 13 cents per pound. Aluminum was quoted at as high as 45 and 50 cents.

The Columbus Brass Company, located at 538-544 Dublin avenue, has just closed one of the best years in the history of the corporation. Preparations are being made for a better year in 1916. The concern was awarded a number of large contracts recently, which are very gratifying to the officers.

Although the new plant of the Solar Metal Company, Cleveland avenue near Third avenue, has only been completed about four months, still plans are being prepared for a large addition. It is the intention to double the capacity of the concern and contracts for the work have been awarded. The concern is now working two forces of men. The concern has closed contracts for thousands of metal doors and sash to be shipped to Europe.

The Ohio Metal Company, located at Fourth avenue and Fourth street, announced through its president, Henry Loeb, that a large addition will be erected as soon as the weather will permit. A lot measuring 45 by 183 feet has been acquired. The company is engaged in the jobbing of all kinds of metal and does considerable manufacturing.

Suits have been brought by the Welsbach Company and the Welsbach Light Company and the Bryant Electric Company against the Standard Stamping Company of Marysville, Ohio, charging infringement of patents.—J. W. L.

DETROIT, MICH.

JANUARY 10, 1916.

The brass, copper and aluminum industry is closing one of the best years financially it has ever experienced. This not only includes Detroit, but its suburbs and other cities and towns in Michigan. The automobile industry, together with orders for war material, has been the real cause of this prosperity.

At the opening of the year manufacturers were pessimistic and men were discharged and everything cut to the minimum. Operations were continued along these lines until early spring, when business took a jump due to opening of the automobile season and the placing of war orders. This condition was soon followed by heavy orders for motor trucks and pleasure cars from all over the United States and Canada. Then followed further orders from Europe for motor cars of all kinds. This boosted the automobile industry out of all previous proportions, plants immediately were enlarged, and new machinery ordered. All this called for increased production of brass, copper and aluminum material, and from that time until the present business advanced by leaps and bounds. Brass and aluminum concerns not engaged in making automobile parts became swamped with war orders, and at present have work booked that will keep them busy indefinitely. At the opening of 1915 thousands of men were clamoring for employment. Today skilled mechanics are in strong demand, and any man that is good for anything at all may obtain a steady position.

The Detroit Ball Valve Company, of 572 Franklin street, is one of the concerns which has shown progress within the last year. For a considerable time some of the largest concerns have been using its product, and of late it has been adopted by several railroads where it is found particularly serviceable. It was designed to take the place of the flat disk metal or composition valve so commonly used. The factory at present is running overtime in order to fill its orders. This is one of the concerns that is not depending on the automobile trade and war orders for prosperity.—F. J. H.

It is the general impression in metal houses of this city and surrounding manufacturing places that the business outlook is still very promising and the sentiment finds general expression that the year 1916 will start out under most favorable conditions for a record year of business.

Important and significant as is the manufacture of automobiles and automobile accessories in Detroit, let it not be thought that this is the one large industry of the Michigan metropolis. In the metal line Detroit leads the world in the manufacture of adding machines; it is the first city of the country in the aluminum industry, and is second only to Waterbury, Conn., in the production of brass. It is also the largest stove manufacturing center in the country. The romance of Detroit is most generally associated with the development of the automobile industry within her portals. The pioneers in this industry worked under great difficulties, often amid want, and were generally regarded as visionaries. But the ideas that were originated in small cramped rooms are being carried out in large steel and concrete structures that produce hundreds of thousands of automobiles a year.

Today there are thirty-four automobile factories in Detroit, and from every account all of them are enjoying prosperity. It is estimated that the automobile production in Detroit factories for 1915 will reach over 500,000, and with an approximate value of $400,000,000.

A department for japanning and enameling has been added to the Barney Nehl Plating Company at 248 Brush street. Electrical ovens of the newest design have been installed and experts have been employed to do the work under Mr. Nehl's personal attention. Mr. Nehl promises that the same careful attention will be given the work in this department that has established a country-wide reputation for his plating work. Mr. Nehl has been established in the plating business for 25 years.

The McRae & Roberts Brass Manufacturing Company, located at Campbell avenue, are running to their full capacity.—P. W. B.

CINCINNATI, OHIO

JANUARY 10, 1916.

The close of the year, and the beginning of 1916, witnesses a high state of prosperity in virtually all lines of the metal industry in this vicinity, in somewhat striking contrast to the situation which existed at the beginning of 1915. At that time, although there was already in evidence something of the activity in the machine-tool trade which has since manifested itself, the shock to business in general caused by the European war was still felt, and was still too recent to enable the trade to grasp readily the opportunities before it. The depression of the early part of 1914, enhanced by the beginning of the war, had left the metal trades, as well as most others, with very little to do. The demand for machine-tools, building materials, brewing and distilling equipment, and other supplies calling for the metals, was extremely dull, and 1915 promised but little more.

However, the year proved to be a happy disappointment in this respect. The activity of the machine-tool trade, which is perhaps Cincinnati's greatest industry, has been phenomenal. The demand for munitions of war to enable the European belligerents to carry on the epocal struggle on the other side struck the country almost without warning, and the scores of plants which have sprung up to meet the demand had to be equipped with the most modern machinery for the purpose. The machinery industry benefited accordingly. Even heavier was the call from abroad for lathes, drill-presses and other metal-working equipment, and this is still in evidence, local plants being worked to capacity, with two and three shifts of men a day in many cases, to meet the demand.

This extraordinary demand for machines, the normal output of the local plants, has almost completely replaced the call for shells and other munitions themselves, which were turned out for a time by some of the concerns in the tool trade. The high prices offered for shell cases at first tempted some of the shops into that work, but the necessary alterations to machinery, as well as other considerations, and the fact that even larger profits could be made simply by sticking to the usual lines, resulted in

the elimination of this kind of work in practically all cases. The year as a whole, therefore, has been one of the best in the history of the local machine-tool trade.

The only jarring chord, as far as the tool men are concerned, has been the machinists' strike, which is still going on, officially; although in effect it is declared by most of the employers that the walkout has been virtually broken for some time. Many of the men have returned to work, the best figures available showing that out of the 3,000-odd who struck only a few hundred remain out.

A significant and authoritative commentary on the labor question, as far as the metal trades in Cincinnati are concerned, is contained in a recent statement issued by the statistical bureau of the Ohio Industrial Commission covering the year, and comparing the wages received with those of the year before. This statement reports an average weekly increase for Cincinnati of $1 a week, ordinary wages, without reference to overtime, which, as indicated, has been the rule in the machinery trade. It is also pointed out that while 15,000 men gained increases in wages by peaceable conference with their employers, only 3,000 were successful in the same object by means of strikes.

The various trades using bronze, brass, copper and other metals in decorative work has participated liberally in the return of prosperity, and anticipate one of the best years in their history in 1916. Such goods as bank fixtures, name plates and the like are certain to find a heavier demand than in several years, in view of the general abundance of money and the increasing willingness on the part of consumers to spend it in abundant quantities. The high prices of cotton, corn and wheat, in the South and the Middle West, respectively, mean that these sections, in which Cincinnati does a large business, the banks and their customers are plentifully supplied with cash, and it is bound to flow this way in ever-growing floods.—K. C. C.

LOUISVILLE, KY.

JANUARY 10, 1916.

A marked improvement has been shown in the copper industry of the Louisville district during the fall. In the spring things were generally dull in the trade, and less distillery work was handled by the coppersmiths than in many years. With the general improvement throughout the country, and a number of plants throughout the state, which were figuring on curtailment, have announced that they will operate to capacity this season. A number of distilleries will also be busy making grain alcohol, and it is understood that as a whole the distilleries of the state will all be operating. This resumption of business with the distillers has called for a good deal of copper repair work, but very little new work. Other lines have been fairly good. Louisville has not been particularly fortunate in obtaining any war order work this year, except in a round about way.

It is said that the Vendome Copper & Brass Works is one of the few concerns in this section of the country to show an increase this season over the corresponding season of last year. The company booked two or three nice spirit distilling contracts in the New Orleans district early in the year, and with this work was enabled to keep fairly busy when other houses were doing practically nothing. A full force has been working during the past few weeks on distillery repair work in the state. The concern reports that it has just closed a big contract with Armour & Company of Chicago for installing a fatty acid plant. This work will consist of erecting tanks and pipe lines of extra heavy material, most of the copper being ½ to 5/16 of an inch thick.

Copper prices are very high, and the market is in a very unusual condition. Local coppersmiths report that with the exception of a few manufacturers supplying old customers, it is practically impossible to obtain shipments of copper tubes in less than three to six months. Some tube manufacturers are refusing orders, while others will not promise delivery in less than six months. Prices on tubes are quoted all the way from 31 cents, as a basing point for the cheapest stock, to $1 per pound for the best varieties. Ingot copper is quoted delivered in Louisville at 23@24 cents, while sheet copper is quoted from 25 cents, a basing point, up to 48 cents a pound. There have been no traveling representatives of copper manufacturers in the city for over sixty days, as the manufacturers are unable to supply demands as it is and are not looking for additional business.

Leading copper men of Louisville report that the Government Navy Yards at Newport News, Va., and large ship builders are buying copper and special castings in quantities, but very little of this work is coming inland, as the freight rates are so high that the Western coppersmiths are unable to compete. About the only work reaching the Western manufacturers consists of tannery work, the tanners being busier in supplying leather for war harness; alcohol orders to fill contracts for alcohol to be used in manufacturing explosives for Europe, and for fuel and beverage purposes abroad, and a few orders for copper work to be used in equipping dye manufacturing plants which are springing up to supply the demand for dye which has arisen since the European commodity was cut off.

Coppersmiths of Louisville and vicinity have been considerably interested in the movement to manufacture commercial dyestuffs in Kentucky and Eastern Tennessee, and are in hopes of seeing this industry open a new field for copper work. At Clay City, Ky., the Pearsite Company, a Pittsburgh, Pa., corporation, has erected a $50,000 plant, and expects to erect additional buildings shortly for the manufacture of inks and commercial dyestuffs. The Federal Dyestuff & Chemical Company, of New York, is erecting an immense plant at Kingsport, Tenn., to manufacture acids of various kinds for manufacturing explosives, and also a line of commercial dyestuffs. The Caldwell Chemical Company, of Evansville, Ind., is now receiving bids for the equipment necessary to erect a plant at Spottsville, Ky., for manufacturing dyestuffs, acids, etc. The latter company will require phenol recovery plants, preheaters, condensers, coal tar stills, etc. In fact all of these concerns are manufacturing acids and materials which have to be manufactured in non-corrosive metals, and if the American dyes hold good after the ending of the war, there should be a new line of endeavor open to the coppermen.

Precious metal workers of Louisville have been very busy for the past six weeks handling quantities of special orders for the holiday trade in the jewelry stores. The advance on platinum from $40 an ounce to $122.88 before the holidays was unlooked for, and will probably have the effect of holding back manufacturing of articles of this description during the new year. During the past year more platinum work was handled than ever before in the history of the precious metal working concerns.

The Ahrens & Ott plant, of the Standard Sanitary Manufacturing Company, at Louisville, has been busy for the past few weeks in almost every department. This plant manufactures brass and copper goods, enamel ware, and a general line of plumbing goods.—G. D. C.

TRENTON, N. J.

JANUARY 10, 1916.

The year just ended has been a peculiar one along the lines of metal industry, starting off poorly and showing a prosperous finish. In the first place the tariff and uncertain conditions of the times worked havoc on business and those who had money to invest or speculate held fast to it. Then the great European war made matters worse for a time and what was made in this country had to be kept here.

But the revival came with the many big demands for ammunition among the fighting nations. Plant after plant was erected and machine plants got busy equipping the plants. With the demand for ammunition came work for this country and the money market became better. While some local manufacturing plants producing metal products claim that business could be much better others are feeling the effects of prosperity. When orders become plentiful in late fall or early winter concerns feel relieved. At some plants there are plenty of orders on hand to carry matters over until spring. In some cases it costs as much to operate a plant with half help as it does with all hands employed.

William G. Wherrey, general manager of the Skillman Hardware Manufacturing Company, informed a representative for THE METAL INDUSTRY that despite Democratic juggling and the war he found business a little better this year than last. "The prospects are good," he said, "for a busy winter and spring trade." The Skillman Company recently installed electric power in the place of steam and finds it more convenient and saving.

Philip Billingham, head of the Billingham Brass Foundry, says that he found the past year a pretty good one in his business when

he compared it with the year 1914. Business was dull during the early summer, but it began to pick up and now he is employing extra hands in the brass department. There has never been a strike at the plant and the employees are paid good wages to prevent a walkout and the tying up of government work. The Billingham Company manufactures government specialties which have to be turned out on time.

The John A. Roebling's Sons Company expects to begin operations during the winter in its new copper cable shop on Hancock avenue. This plant takes the place of the one destroyed by a fire nearly a year ago, and comprises more smaller buildings. Because of the threats received the company has increased its number of guards. At the time the cable shop was destroyed trace chains were being made there for the Allies. The fire greatly delayed the cable department and this shop will give employment to several hundred men when it is completed.

Democratic times caused hard times at the J. L. Mott works at the beginning of the year and there was not enough work on hand during the summer to keep half the force working full time. Rather than lay any off the company cut the working days down to four, and in some cases three. Later there was an improvement in business and the working time was increased. When the company finally received the $5,000,000 war order for time fuses and shells the plant had to increase the number of hands. Fully 300 extra hands are now employed and there is both a day and night shift in the special brass department created for the manufacture of munitions. New hands are being added weekly. On top of this order came another one for war munitions through the Bethlehem Steel Company. The many boys and young men engaged in assembling the shells receive big pay on the piece work system. Mere boys are engaged in this work of arranging the screws, pins and caps after the material is arranged on long boards. Two strikes delayed the Mott works during the very busy season, but now there is peace once again between employer and employee.

Business increased about forty per cent. at the plant of the Trenton Brass and Machine Company during the latter part of summer and the prospects are good for a busy winter and spring. The Bechtel Engraving Company finds business a little improved, but not up to the standard.

The McFarland Foundry and Machine Company reports business picking up during the past few months.

The Ingersoll-Trenton Watch Company has experienced a very busy season and will have to build a new addition to the plant in the early spring. Besides the watch company, the Mercer Automobile Company, John A. Roebling's Sons Company, and Trenton Smelting and Refining Company have erected big additions to the respective plants during the past season. The Mercer Company is now completing an addition 85 by 400 feet.

Strikes greatly delayed work in some of the local plants where brass and other metal articles are manufactured. The Mott, Roebling and Mercer Companies granted shorter hours to their many employees during the fall. The recent strike at the New England plants greatly delayed shipments of metal goods to this city and also held up hundreds of Christmas articles.—C. A. L.

NEWARK, N. J.

JANUARY 10, 1916.

Now that there is a little temporary lull in business while business men and manufacturers are taking inventory, making boiler inspections, doing necessary repair work and making needed alterations, it might be well to take stock of business realities, tendencies, prospects, etc. Are general business conditions better now than they were a year ago? If there has been an improvement in the volume of trade, has it been at the expense of quality? If business is at all better at the opening of 1916 than it was at the beginning of 1915, has the improvement been of such a nature as to make larger and stronger foundations for continued prosperity, or has it been like the feet of the image in Nebuchadnezzar's dream—a mixture of both iron and clay; an industrial growth which may crumple under the tests which the future has in store? If peace were to be declared tomorrow and war order business were to disappear, would there be another period of depression, or is business on such a firm foundation that, aside from a temporary shock during the period of transition, business would continue to forge ahead? These are questions which business men and manufacturers are asking themselves these days. Many opinions are held, but no man can prophesy with assurance as to what this new year has in store for the business and manufacturing world. But prophecy based upon careful study of the development of business (and politics) during the past year and business tendencies at present will doubtless prove more true than that based on mere opinion.

Local manufacturers of metal goods soon found that the increase in war order business throughout the country was actually hurting their legitimate trade. Such was the demand for chemicals of various kinds, for spelter, brass, copper, platinum and many other things needed for war use, that prices soared and they found it difficult to get material with which to do their regular work, though the volume of that work was below normal. As the months passed and confidence began to return slowly and manufacturers of novelties in other lines began again to plan for the future they would turn to the metal manufacturers for limited quantities of material needed by them, but on hearing of the new and higher prices, would decide to wait a while longer, in the hope that prices would come down somewhere near normal again.

During the latter part of the summer business conditions seemed to be improving slightly and predictions were freely made that when the fall season once really opened business would be good. Orders in many lines became larger and more frequent, but business was spotty. A week or two of greater activity would be followed by a dull spell. With the approach of fall the real dull spells became less frequent and of shorter duration. The lines of men which had been going from shop to shop looking for work earlier in the year, grew shorter, as the trade balance which a year before had been against the United States began to loom large in favor of the United States; confidence slowly began to reappear locally as elsewhere. Many who had been blaming the Democratic administration, the new tariff law, etc., as well as the war, for the depression, began to tell how the war was a life saver to this country, and had prevented a greater panic than this country has ever seen. Many others, however, state that they do not think the administration responsible for the depression, and some point out that as the new tariff law had been in operation only a month when the war broke out, the depression should not have been due to the evil effects of the law.

The outlook for the new year is generally thought to be good. Few look for a real boom, but a great number expect big business in 1916. Some qualify this by stating that business will be good if the war continues. Many think, however, that all lines have gained such headway within the past six months that, with such orders as are almost sure to come to us from abroad during the reconstruction, there will be a period of prosperity covering a number of years.

Local importers of platinum state that it is almost impossible to get any from Europe. Some is coming in from South America, but the quantity is very small. Because of the constantly soaring prices of this metal everyone is using every available bit of scrap, and many manufacturers who have had stock on hand which was not moving rapidly have melted it up and made it into goods in greater demand.

Other metals such as brass, bronze, copper, etc., are very high, but the demand for goods made of these materials is now so great that people no longer delay ordering goods needed.

Plans are being made to increase the output of the Merigold Electro-Plating Company, 95 Chestnut street. Business is reported to have been very good during the past few months. The outlook for a busy year ahead is declared to be excellent. Complaint is made that the price of chemicals is very high, and this increased cost cannot well be passed on to the customers.

Hugh Baxter, of the Hugh Baxter Plating Company, 353 Mulberry street, states that business has been very good during the past few months and that the outlook for the coming year is very good. Mr. Baxter thinks that if the war should stop soon it would cause another check to business.

The Central Plating Company, Chestnut and Mulberry streets, is uniting with the Klump-Greenfield Company, and has just moved to 54 Frelinghausen avenue, where it will have more room to handle its increasing business. With its increased facilities the firm will be able to handle anything in the plating line.

The American Enameling Company has been granted a permit for an addition to its factory, in Bayway, Elizabeth. This will be an enlargement of the foundry and will cost $5,000.—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Evans Stamping and Plating Company, Taunton, Mass., has awarded the contract for the construction of an addition to its machine shop.

The Buckeye Foundry Company, Cincinnati, Ohio, is contemplating the construction of a one-story, 45 x 182 foot foundry building at an estimated cost of $4,300.

The C. Cowles & Company, New Haven, Conn., are moving its brass foundry to a new location and are also enlarging it. The company reports that they are not in the market for any new equipment at the present time.

The Scovill Manufacturing Company, Waterbury, Conn., maker of brass goods, announced December 16 the payment of a 10 per cent. bonus, based on annual salary, to all its salaried employees. Some time ago the company increased the wages of its employees on piece work and day wages 10 per cent.

The Gehnrich Indirect Heat Oven Company, 60 Franklin avenue, Brooklyn, N. Y., will install eight enameling ovens in the plant of the Stewart-Warner Speedometer Corporation, Chicago, Ill.; six in the works of the National Cash Register Company, Dayton, Ohio, and three in the Lyon Metallic Manufacturing Company, Aurora, Ill.

The Supplee-Biddle Hardware Company, Philadelphia, Pa., announce that owing to the increased volume of business in their Monel metal casting foundry, they have been obliged to extend their capacity which they have increased sufficiently to enable them to take care of all business promptly and to give special attention to emergency orders.

Wright & Co., 30 Mutual street, Toronto, Canada, is in the market for an electro-plating dynamo of about three volts, and also other equipment necessary for a plating shop. The company would also like to hear from manufacturers of electric fixture parts, such as brass hooks, loops, etc. The Wright company operates plating, polishing and lacquering departments.

Woolsey McA. Johnson is now consulting metallurgical engineer for the American Spelter Corporation, 61 Broadway, New York City, with works at Kusa, Okla. He is acting in an advisory capacity. The American Spelter Corporation makes a high-grade spelter, zinc 99.90 per cent. or more, suitable for cartridge brass, and is now producing with a capacity of eight tons of virgin spelter per day.

The Akron Aluminum Company, Akron, Ohio, recently incorporated with $10,000 capital, has increased it to $20,000 and has taken over the Banner Aluminum Company, of Wadsworth, Ohio, and will operate both companies under the head of the Wadsworth Aluminum Company with quarters at Wadsworth, Ohio. An aluminum foundry and stamping and spinning department will be operated by this company.

The Tallman Brass Company, Hamilton, Canada, is building a two-story addition to its present plant which will be devoted principally to the manufacture of electric fixtures. This company manufactures a line of high grade electric fixtures and has found its present quarters inadequate to complete orders. Among the different departments operated by this company are the following: Brass, bronze and aluminum foundry, brass machine shop, stamping, plating, polishing and lacquering departments.

Robert Grimshaw, who has been a frequent contributor to THE METAL INDUSTRY, and who has been for the past twenty years an editor and publisher in Dresden, Germany, has now returned to this country, and is giving a course of four lectures in New York on trade journalism. These lectures are held in one of the halls of the Packard Commercial School, Lexington avenue and Thirty-fifth street, New York, N. Y., on Wednesdays during the month of January.

The Piqua Plating and Novelty Works, Piqua, Ohio, has been started by John Fecker and A. C. Page. The business is a general job plating plant and a grinding room, plating, polishing and lacquering department will be among the departments operated. The company will also manufacture electric metal polish. Mr. Fecker is the superintendent of the Favorite Stove and Range Company, while Mr. Page is foreman of the plating department of the same company. The management of the new plant will be in charge of Benjamin Wise.

The Doehler Die Casting Company, of Brooklyn, N. Y., and Toledo, Ohio, have placed contracts for their new Toledo factory buildings to contain 70,000 square feet of floor space, consisting of foundry, machine shops and offices. With these buildings, which are to be ready for occupancy May 1, completed, this company will be in a better position than ever to give their Western patrons their prompt and efficient service, which they have heretofore received from their Brooklyn plant.

The Moser Pattern & Foundry Company, of Newark, O., who specialize in aluminum match plates, wood and metal patterns and molding machine equipment, announce that they are enjoying a very nice business with the brass trade. In the past year they have been making a large number of patterns and plates for all classes of brass fittings and special roll-up core box devices, for delicate and intricate cores, especially adapted for the brass trade. This firm is a complete organization with a 20-year record in both pattern and foundry work.

The Snyder Electric Furnace Company, manufacturers of the Snyder electric furnace, Chicago, Ill., report that they have had a fine year and have installed electric furnaces in eleven plants in the United States, two in Canada and three in England, making sixteen installations in all. Of these installations four are devoted to the smelting of ferro-silicon, seven to special chemical work, while one has been started on the melting of brass at the plant of the Chicago Bearing Metals Company. We hope to have more information relating to the performance of this furnace for melting brass in the near future.

The Haynes Stellite Company of Kokomo, Ind., has placed a contract with the Snyder Electric Furnace Company, Chicago, Ill., for a 1½-ton per 24-hour electric melting furnace. The furnace has an eight-ton holding capacity, 50 K.W. input, and will produce 12 heats per 24 hours. The Haynes Stellite Company is the manufacturer of the casting alloy Stellite, an alloy of chromium and cobalt, which has been making a number of remarkable records during the past two or three years. Mr. Elwood Haynes, president of the company, will be remembered as the manufacturer of the first American automobile, and it is planned to hold a great anniversary celebration in his honor next year at Kokomo, Ind.

The Trumpbour Whitehead Brass & Copper Company have announced the opening of their New York warehouse at 307 Canal street, this city. They will carry at all times a varied stock of brass and copper material covering a wide range of sizes in rod, tubes and sheets. They have every facility for the prompt handling of shipments from New York stock. Mr. Trumpbour has spent a lifetime in the brass and copper business and is probably one of the best known metal salesmen in the metropolitan district.

Mr. Whitehead is the head of the Whitehead Metal Products Company, of Boston, who have made a notable success in a similar line of business. In view of the ample capital and efficient experienced organization in charge of this concern, there is every reason to believe that it will be a notable addition to the metal selling concerns of the East.

It is reported in the daily press that the Anconda Copper Mining Company broke ground December 14, 1915, at Great Falls, Montana, for an enormous zinc refinery. It is stated that the plant will cost $2,000,000, and will be ready for operation next September. It will employ several hundred hands and produce 70,000,000 pounds of zinc yearly. This plant, it is claimed, will be the largest ever built to use the electrolytic process in this country. This enterprise is the result of the rise in price of zinc and the constantly increasing demands for the metal, which factors combine to make it profitable to operate a plant

working on high grade zinc ores. It is only until recently that the electrolytic process has been brought forward to such an extent that practically pure spelter can be produced by this means. Electrolytic spelter is also now being made, several tons daily, by the Weedon Mining Company, at Welland, Ontario, Canada, and the Consolidated Mining & Smelting Company at Trial, B. C. The Bully Hill Copper Company in California may become a regular producer.

W. J. Smart, of the Eureka Pneumatic Spray Company, New York, N. Y., manufacturer of air brushes, etc., reports that letters patent have been granted him for process of producing ornamental finishes, said application being granted on December 27, 1915. The final government fee having been paid, the patent will at once go to issue.

During the past few years, antique bronze and other finishes in relief have been turned out by means of the sprayer, and the use of lacquer enamel; the base color or coat being applied wet, and of solid body, and the verde, or toning coat, being applied with the sprayer, using a fine tip, and holding sprayer some distance away, permitting the volatile material to become half dry in the atmosphere, so that the little particles would be attached to the body coat of lacquer, without amalgamating. This permitted of erasure of the toning coat, by means of an abrasive cloth, use of turpentine, and other materials; and enabled manufacturers to turn out most beautiful finishes at an economical cost. This greatly benefited the trade, public, and working classes. The Patent Office at first disputed the possibility of doing this, and it was necessary to actually produce the results at the Department of the Interior.

A license will be granted to all concerns using said finish, at a price varying from $25 to $100, allowing said concerns to produce this finish during the seventeen years' life of this patent; and, in addition to the license, he will give instruction without additional cost. Upon issue of the above-mentioned patent, due notice will be given.

REMOVAL

The Standard Brass Foundry Company, manufacturer of high grade castings in aluminum, brass and bronze, has moved its plant from 1831 Columbus Road to 988-992 East Sixty-seventh street.

CHANGE OF OFFICERS

William R. Webster, second vice-president of the Bridgeport Brass Company, Bridgeport, Conn., has been appointed first vice-president of the company to succeed George E. Somers, deceased and G. P. Miller has been made secretary to take the place of Wylie Brown, who resigned from the company. A. P. Swoyer has been appointed general sales manager.

DIVIDENDS

The New Jersey Zinc Company, New York, N. Y., recently ordered an extra dividend of 10 per cent., besides the regular distribution of 4 per cent. This extra dividend is payable to shareholders January 10, and the regular payment is scheduled for February 10.

Directors of the Grasselli Chemical Company, Cleveland, Ohio, December 21, cut a "war melon" by declaring an extra cash dividend of 5 per cent., and a special stock dividend of 10 per cent., in addition to the quarterly dividends of 1½ per cent. on both common and preferred stocks. The combined dividends on both common and preferred shares, including the special dividends, have a cash value of approximately $3,000,000.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture and deal in brass and other metal specialties.—Iroquois Metal Products Company, Inc., Buffalo, N. Y. Capital, $20,000. Incorporators: William H. Sanford, Clarence M. Bushnell and Ulysses L. Caudell, all of Buffalo, N. Y.

To manufacture and sell, brass, bronze, aluminum and gray iron castings of all kinds.—Republic Brass & Bronze Company, Pontiac, Mich. Capital, $25,000. Incorporators: A. C. Scherrer, James A. Ballard, H. J. Brady, and Frank W. Kerr. The new concern recently took over the plant of the Pontiac Motor Castings Company.

CHANGE IN FIRM NAME

The firm of Hermann Gehnrich, manufacturer of enameling, japanning and lacquering ovens, Brooklyn, N. Y., after January 1, 1916, will be succeeded by the Gehnrich Indirect Heat Oven Company, Inc. The officers of the new company will be the same as those of the old firm and are Hermann Gehnrich, president; Charles L. Gehnrich, vice-president, William Gehnrich, secretary and Charles Missenharter, treasurer.

PRINTED MATTER

Cinder Mill—The O. J. Moussette Company, Inc., Brooklyn, N. Y., have issued a new circular describing their Monarch cinder mill which is used for reclaiming brass and other metals from ashes, slag, skimmings and other refuse. Further information may be had upon request.

Metals—Handsome calendars descriptive of the products which they manufacture have been issued by the Standard Rolling Mills, Inc., Brooklyn, N. Y., and E. A. Williams & Son, Jersey City, N. J. The Standard Rolling Mills manufacture sheet britannia metal, casting metals and special compounds, and E. A. Williams & Son, produce Williams bronze and Clover Leaf babbitt metals.

To manufacture non-ferrous metals, etc.—Coates, Bennett and Reidenbach, Inc., Rochester, N. Y. Capital $250,000. This corporation has been formed to take over the Genesee Metal Company, the Hazard, Coates and Bennett Company, both of Rochester, N. Y., and the Lackawanna Storage Yards, Inc., Lackawanna, N. Y. The persons in active management of the new company will be F. W. Reidenbach, president of the Genesee Metal Company; John Bennett, president of the Hazard, Coates and Bennett Company, and R. H. Coates, treasurer of both companies.

Metal Hose—The Metal Hose & Tubing Company, 253 Tillary street, Brooklyn, N. Y., have issued a six page folder giving the prices and description of their metal hose and flexible metallic hose, which is intended for all purposes. Copies may be had upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW FOR 1915—OUTLOOK FOR 1916

By J. J. Archer.

REVIEW.

In reviewing the year 1915 one has but to say that the year 1915 was the greatest business year this country had ever seen. What else matters! Nothing, absolutely nothing. Business is business. Think what we have made out of Europe's necessities. The total trade for 1915 was $5,350,000,000, exceeding the biggest previous year by 25 per cent. and yielding a credit balance of close to $1,750,000,000, two and a half times as great as any previous balance.

There may be a small minority of high-minded souls who feel that America sold her heritage (the heritage she fought for and shed her blood for) for a "mess of pottage," but when that "mess of pottage" yields a credit balance of close to $1,750,000,000, even the highest minded souls, in this very materialistic America, are apt to feel, in their pockets if not in their hearts, thankful that the ruler of this great country, quite early, learned how to write.

We have had the biggest business ever known, all metals have been active. Iron and steel started long before copper began to move. Everybody has made money. The man in the street, also his sisters and his cousins and his aunts were all able to get their little rake off. On a recent order for 500 tons aluminum there was a difference of 5 cents per pound to be divided up before buyer and seller got together. Mills all over the country are running night and day. The shipyards are booked to capacity for two years ahead.

And all this activity and profit has happened through the war in Europe. It surely has been a great year for America.

OUTLOOK FOR 1916.

The outlook for 1916 is bright whatever happens. Europe and the rest of the world is going to need our goods. We may have to get down to a lower basis to catch the trade. It will not be as easy as it has been in 1915. The war is likely to be raging for another six months, and for that length of time enormous profits will continue to be made by this country owing to the dire necessities of the nations at war. After the close of the war the demand for reconstruction material will come along, but it will have to be met on a more competitive basis and at considerably lower prices.

In the Outlook for 1915, about a year ago, I said: "The demand from Europe for all kinds of manufacturers is growing daily and 1915 should be a banner year." New industries have been created, enormous wealth has been accumulated to be used as a reserve force when competition forces lower prices during the coming year. The outlook for 1916 is surely most encouraging.

COPPER.

The year 1915 has been a most eventful year for copper. Owing to the demand for certain brands of high grade lake, for special war munitions, extraordinary premiums were obtained, and the demand for these special brands at times seems to have been ahead of production. The home demand for copper during the entire year was considerably less than normal. The ordinary foundry business was at a standstill. Casting copper, that generally sells within a quarter or three-eighths of a cent of the price of electrolytic, had been trailing along at a cent and sometimes more than a cent a pound below electrolytic. The demand for the lower grade brands of lake was no better. It was the reported restriction of 50 per cent. in the production that was supposed to be enforced by some of the producers when the war started in the fall of 1914 that saved the copper market during the first quarter of 1915. The effect of this reported restriction was, of course, to steady prices—some producers did not reduce their production—but the talk about the effect was enough and prices began to advance soon after the opening of 1915.

The year opened with an estimated stock of copper on hand of from 170,000,000 to 175,000,000 pounds, say 173 million, and the price of electrolytic was 12.85 cash New York or 13 cents the producers' price on the usual delivered terms, 30 days. The price gradually advanced to 20½ on June 15. The report that big war contracts, calling for millions and millions of pounds of copper, had been placed and the active buying during May and June was to cover for these war orders. After this June buying movement prices sagged off again and touched 17½ cents toward the end of August. September and October were very dull months and the price was held fairly steady at around 18 cents. During November the London market began to advance, partly owing to the decrease in the stocks of copper in England and France, but, of course, principally owing to the dictum of the one seller for two large American producers in London. There is no selling competition in the London market between the American producers. Of course, there is no combination, nothing like that—that has an unlawful sound about it somehow—but the two biggest producers in America just happen to always desire to sell their copper at the same price. The arrangement works like a charm, things are dull over here. Consumers won't buy; if they don't really need copper, they ought to. Mr. Londonman is given the tip, electrolytic today, November 1, say, is around £75, November 30 £79 10s., and December 31 electrolytic is £108 and the price here is 22½ to 23 cents and we are told we have no spot copper. Consumers are crazy for it; price is going to 25 cents; can't stop it; "haven't got any copper." "January, February—can't let you have a pound, all sold up to the end of March," etc, etc.

The quick advance in price was very materially established when it was announced that the British Government had bought 60,000 tons of copper for delivery over 1916. The price that got into the papers was 21 cents, but there was no official confirmation, and later it leaked out that 20 cents was nearer the mark. However, the "paper" price of 21 cents was good enough, and the market that day was boosted to 21 cents.

That seems to be the condition of the copper market at the end of the year—25 cents almost in sight and 30 cents kind of hinted at, "if this demand keeps up." And copper costs from 5 to 9 cents per pound and this price covers all charges.

Statistically no one really knows the situation. We have been asked a thousand and one times, "Why don't the producers publish the monthly statistics as they formerly did?" We can only say we suppose it is because the producers do not want the consumers to know how much copper they are carrying. Of course there may be a better answer to this very pertinent and interesting query, but if there is we don't know it.

It is interesting. Why don't they?

According to the United States Geological Survey the production of refined copper during 1915 is estimated at 1,498,560,000 pounds. Surplus stocks on January 1, 1915, 173,000,000 pounds, gave us an available supply for the year of 1,672,200,000 pounds. Deliveries were: Home consumption, 952,000,000 pounds; exports as per Custom House returns, 596,520,960 pounds; total deliveries, 1,548,520,960 pounds, leaving a stock on hand January 1, 1916, of 123,679,040 pounds, against 173,640,000 pounds January, 1915.

Deliveries for the year exceeded the production very nearly 50,000,000 pounds, leaving a stock of copper on hand January 1, 1916, of 123,679,040 pounds, against 173,640,000 pounds on January 1, 1915. The total exports for the year were 596,520,960 pounds, against 806,912,960 pounds in 1915, a decrease of 210,392,000 pounds. The decrease of 50,000,000 pounds in the stocks for the year is more than accounted for through the partial restriction in output during the first quarter of the year. Had all the mines been running full the stocks on the first of January, 1916, would have shown an increase of over 2,000,000 pounds for the year. With a stock of copper on hand of over 123,000,000 pounds on January 1, 1916, one would have thought the two or three large selling agencies could have scraped together a few hundred tons to help out belated consumers who needed a little Janu-

ary copper, instead of crying "Wolf, wolf," when there was no wolf—nor anything that looked like a wolf—but really a lot of copper lying around; and apparently so were the producers. At the end of the year the copper market closed, shall we say, in a "blaze of glory" (that's stolen) at around 23 cents for electrolytic and lake and about 22 cents for casting, with no copper in sight, but about 123 million pounds hidden away somewhere.

TIN.

The tin market during the year has behaved remarkably well, due, probably, to the restraining arm of the mighty British Government. (The arm is a little out of practice, but it is gradually developing with steady practice.) There have been one or two violent outbreaks in the market owing to reported stoppage of supplies, restrictions, closing of the Suez Canal, and sinking of ships, but beyond these interruptions prices have ruled fairly steady. Opening at around 34 cents, the price advanced to 55 cents in March, then gradually declined to 37⅜ cents in May. June prices were higher again, but sagged off to around 32 cents in October, the low point for the year, and closed at around 40 cents at the end or the year. Owing to the restrictions placed on the metal by England, trading has not been active at any time and consumers have been able to cover their requirements on a fairly even market.

LEAD.

The price of lead during the year has followed more or less regularly the fluctuations in copper and spelter. Opening at 3.80, the price declined 10 points to 3.70 on January 12. That was the low point for the year. Prices then gradually advanced to 7 cents on June 12. This very closely followed the advance in copper and spelter in the same month. This price of 7 cents was the high point for the year. After that prices sagged off again to 4.50 in August and again in September, and then prices advanced gradually to 5.50, the trust price at the end of the year.

According to the estimates from the United States Geological Survey, the production of lead during 1915 was over 600,000 short tons, against 522,864 tons in 1914, an apparent increase of about 78,000 tons. The final figures will probably show an increase of a few more thousand tons. The imports of lead in ore are estimated at 9,625 short tons, 50,825 tons in base bullion and about 400 tons of refined and old lead, making a total of 60,850 tons. Of the imports in 1915 about 58,000 tons came from Mexico, against 23,141 tons in 1914. These imports from Mexico compare with an average of over 100,000 tons before the fighting. The exports for the year of lead of foreign origin are estimated at 43,000 tons, against 31,051 during 1914. The exports of domestic lead for 1915 are estimated at 76,000 short tons, compared to 58,722 tons in 1914.

The amount of lead available for 1916 is estimated as 452,000 tons, against 449,052 tons in 1914.

The average price of lead for the year was 4.67½ in New York, and 4.57 East St. Louis.

SPELTER.

The spelter market has made the greatest stir in the metal market. Opening at around 5.70 New York and 5.55 East St. Louis, prices were run up to 27½ cents in June, when lead and copper both reached high levels. Since then the price sagged off, subject to more or less fluctuations, and closed at the end of the year at around 17⅜ for prompt New York and 17¼ East St. Louis.

The apparent domestic consumption for the year is estimated at 362,000 tons. Comparing the consumption in 1915 with 299,130 tons in 1914, 295,370 tons in 1913, and the 340,341 tons in 1912. The increased consumption is not large, when the larger exports of brass and brass manufactures are taken into account.

The average price of spelter at East St. Louis for the year was 14.16, against 5.11½ in 1914 and 5.61 in 1913.

ALUMINUM.

The price of aluminum has risen steadily throughout the year, from about 19¼ cents at the opening to 60 cents a pound paid for the No. 1 virgin 98-99 during November. The price of sheets after selling up to 75 cents base closed at 60 cents. There has been a fair export demand, but the market at the close of the year is very dull and prices are today 5 to 6 cents below top figures in November. The Auminum Company's price for sheets is reported to be around 50 cents.

ANTIMONY.

With the embargo by the British Government on exports from England in the spring of 1915 of Cookson's and Hallett's antimony, the supply was dependent on Chinese and Japanese, and these grades immediately advanced in price. The highest prices for the first half of the year were reached in June, the same as with all other metals. Towards the end of the year the market became very firm again. Spot stocks were scarce and spot antimony was quoted at 41 cents, with American at the same price. The indications are that spot antimony will be higher, as supplies are light. Futures are offered at concessions of from 5 to 6 cents per pound.

SILVER.

The silver market has ruled fairly steady throughout the year. Prices have fluctuated within a range of about 3 cents an ounce, until December, when the highest prices of the year were reached, the high point being 56¼ cents New York, and the market for the year closed at 55 cents, against 48¾ at the opening.

PLATINUM.

The prices for platinum have advanced steadily throughout the year. The market opened dull at around $44 for the ordinary refined and $47 to $48 for the 10 per cent. hard, and closing scarce at from $88 to $100 at the close.

QUICKSILVER.

The quicksilver market has been quite active owing to the demand for certain war munitions and also quite an active demand from chemical houses. The price opened at about $50 per flask, and at the close the leading interest was quoting $155 per flask. The recent active advance is partly attributed to the freight congestion around New York, and shipments that should have been here several weeks ago are still being held up.

SHEET METALS.

Sheet metals have, as usual, pretty closely followed the fluctuations in the ingot copper, except that sheets and brass are very much more sensitive to any advance in copper, while for months they will altogether ignore any decline in the price of copper. Sheet copper is quoted at the end of the year at 28 cents per pound, against 18½ cents at the opening. Copper wire at the opening was quoted at 14½ cents and at the close 25 cents, on a 23¾ to 24 cents copper market.

OLD METALS.

The market for scrap metals has been fairly satisfactory during the year 1915. During the first half of the year prices of all scrap advanced until the climax of high prices in June. With the advance in copper during the last month of the year some really good money must have been made on the pigging up of copper by the large producers, and the market for the year closes with—suppose we say—more or less "everybody happy!"

DECEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Closing.
COPPER.			
Lake	23.25	19.25	23.25
Electrolytic	23.25	19.25	23.25
Casting	22.25	18.75	22.25
TIN	40.50	37.25	40.50
LEAD	5.50	5.25	5.50
SPELTER	18.00	14.75	17.25
ANTIMONY (Chinese and Jap)	40.00	39.00	40.00
SILVER	56¼	53⅞	55

WATERBURY AVERAGE

The average pries of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn:

Lake Copper. 1915—January, 14⅛. February, 15.25. March, 15.75. April, 18.50. May, 22.50. June, 22.50. July, 22.25. August, 19.50. September, 18.50. October, 18.25. November, 19⅜. December, 20.75. Average for year, 18.94.

Brass Mill Spelter. 1915—January, 6.55. February, 11.85. March, 12.15. April, 13.85. May, 20.55. June, 25.60. July, 24.90. August, 19.30. September, 17.85. October, 16.85. November, 19.36. December, 21.15. Average for year, 17.50.

PIG IRON AND METAL PRODUCTS OF THE UNITED STATES

Calendar Years 1906-1914. (1915 Estimated.)

(FROM THE UNITED STATES GEOLOGICAL SURVEY.)

PRODUCTS. METALLIC.	1906. Quantity.	1906. Value.	1907. Quantity.	1907. Value.	1908. Quantity.	1908. Value.	Products.
Pig iron (spot value) long tons	25,307,191	$505,700,000	25,781,361	$529,958,000	15,936,018	$254,321,000	Pig iron.
Silver, commercial value, troy ounces	56,517,900	38,256,400	56,514,400	37,299,700	52,440,800	28,050,600	Silver.
Gold, coining value, troy ounces	4,565,333	94,373,800	4,374,827	90,435,700	4,574,340	94,560,000	Gold.
Copper, value at New York City, pounds	917,805,682	177,595,888	868,996,491	173,799,300	942,570,721	124,419,335	Copper.
Lead, value at New York City, short tons	350,153	39,917,442	375,099	33,760,424	310,762	26,104,008	Lead.
Spelter, value at N. Y. City, short tons.	199,694	24,362,668	223,745	26,401,910	190,749	17,930,406	Spelter.
Quicksilver, value at S. Francisco, flasks	26,238	958,634	21,567	828,931	19,752	824,146	Q'ksilver.
Aluminum, value at Pittsburgh, pounds	14,910,000	4,262,286	17,211,039	4,926,948	11,152,000	2,434,000	Aluminum.
Antimony, value at S. F'cisco, short tons	1,766	602,949	2,022	622,046	13,629	1,264,771	Antimony.
Nickel, value at Philadelphia, pounds	.....	.....	9,910	1,322,985	.....	.....	Nickel.
Tin, pounds	.....	35,600	.....	33,285	.....	.....	Tin.
Platinum, value (crude) at New York City, troy ounces	1,439	45,189	357	10,589	750	14,250	Platinum.
Total value of metallic products	.....	$886,110,856	.....	$903,802,244	.....	$549,923,116	

PRODUCTS. METALLIC.	1909. Quantity.	1909. Value.	1910. Quantity.	1910. Value.	1911. Quantity.	1911. Value.	Products.
Pig iron (spot value) long tons	25,795,471	$419,175,000	26,674,123	$412,162,486	23,257,288	$327,334,624	Pig iron.
Silver, commercial value, troy ounces	54,721,500	28,455,200	57,137,900	30,854,500	60,399,400	32,615,700	Silver.
Gold, coining value, troy ounces	4,821,701	99,673,400	4,657,018	96,269,100	4,687,053	96,890,000	Gold.
Copper, value at New York City, pounds	1,092,951,624	142,083,711	1,080,159,509	137,180,257	1,097,232,749	137,154,092	Copper.
Lead, value at New York City, short tons	363,319	31,245,434	389,211	34,250,568	405,863	36,527,670	Lead.
Spelter, value at N. Y. City, short tons.	230,225	24,864,300	252,479	27,267,732	271,621	30,964,794	Spelter.
Quicksilver, value at S. Francisco, flasks	21,075	957,859	20,601	958,153	21,256	977,989	Q'ksilver.
Aluminum, value at Pittsburgh, pounds	34,210,000	6,575,000	(h) 47,734,000	8,955,700	46,125,000	8,084,000	Aluminum.
Antimony, value at S. F'cisco, short tons	12,896	1,231,019	14,069	1,338,090	14,078	1,380,556	Antim. L'd.
Nickel, value at Philadelphia, pounds	19,284,172	10,027,769	25,359,544	13,186,963	890,000	127,000	Nickel.
Tin, pounds	.....	4,832	.....	23,447	.....	56,635	Tin.
Platinum, value (crude) at New York City, troy ounces	638	15,950	773	25,277	940	40,890	Platinum.
Total value of metallic products	.....	$764,309,474	.....	$762,472,273	.....	$672,153,950	

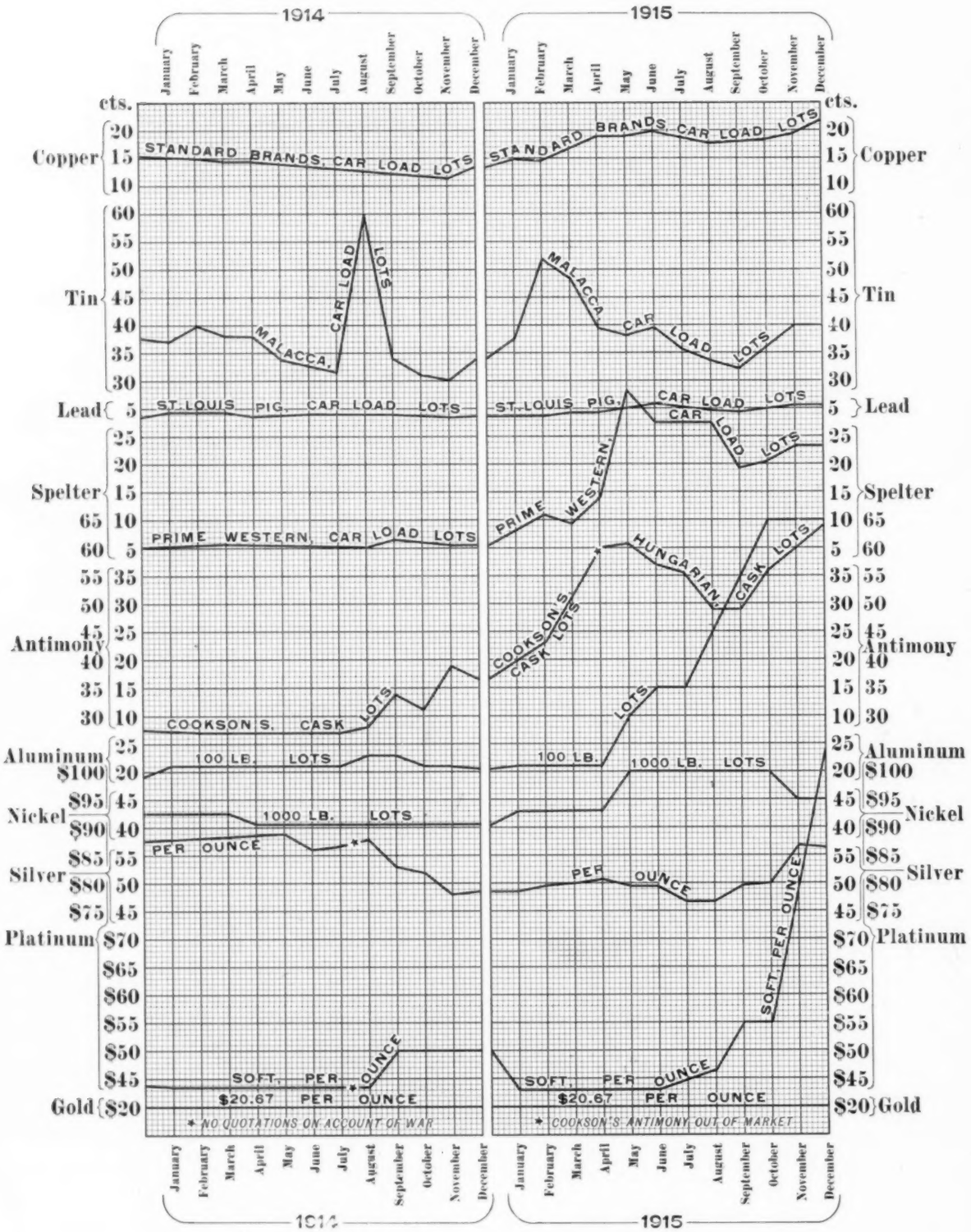
PRODUCTS. METALLIC.	1912. Quantity.	1912. Value.	1913. Quantity.	1913. Value.	1914. Quantity.	1914. Value.	Products.
Pig iron (spot value) long tons	30,180,969	$420,563,388	30,388,935	$458,342,345	22,263,263	$298,777,429	Pig iron.
Silver, commercial value, troy ounces	63,766,800	39,197,500	66,801,500	40,348,100	72,455,100	40,067,700	Silver.
Gold, coining value, troy ounces	4,520,717	93,451,500	4,299,784	88,884,400	4,572,976	94,531,800	Gold.
Copper, value at New York City, pounds	243,268,720	205,139,338	1,224,484,098	189,795,035	1,150,137,192	152,968,246	Copper.
Lead, value at New York City, short tons	415,395	37,385,550	436,430	38,405,840	512,794	39,997,932	Lead.
Spelter, value at N. Y. City, short tons.	323,907	44,699,166	337,252	37,772,224	343,418	35,028,636	Zinc.
Quicksilver, value at S. Francisco, flasks	25,064	1,053,941	20,213	813,171	16,548	811,680	Q'ksilver.
Aluminum, value at Pittsburgh, pounds	65,607,000	11,907,000	72,379,000	13,845,000	79,129,000	14,522,700	Aluminum.
Antimonial lead, short tons	13,552	1,311,348	16,665	1,675,179	16,667	1,572,167	Antim. L'd.
Nickel, value at Philadelphia, pounds	.....	.....	481,565	79,393	845,334	313,000	Nickel.
Tin, pounds	260,000	124,800	(k)	36,970	208,000	66,560	Tin.
Platinum, value (crude) at New York City, troy ounces	1,005	45,778	1,034	46,530	6,324	280,885	Platinum.
Total value of metallic products	.....	$854,779,309	.....	$882,980,156	.....	$678,938,735	

1915 ESTIMATED.

PRODUCTS. METALLIC.	Quantity.	Value. Total.	Value. Per Unit.
Pig iron, long tons*	30,000,000	(i)	(i)
Copper, pounds*	1,647,000,000	$236,000,000	$0.173
Gold, ounces, fine†	4,300,489	98,891,100	20.67
Antimonial lead, short tons*	20,000	1,886,000	(i)
Lead, short tons*	565,356	53,110,100	(i)
Spelter, short tons*	490,000	139,160,000	(i)
Quicksilver, flasks*	20,681	(i)	(i)
Silver, ounces, fine†	67,485,600	(i)	(i)
Nickel, pounds†	38,966,138	(i)	(i)

(*) Figures from United States Geological Survey.
(†) Figures from Engineering and Mining Journal.
(e) Importations for 10 months only.
(i) Figures not available.
(h) Consumption 1910-1911-1912.
(j) Included under unspecified products.
(k) Small production from Alaska, South Carolina and South Dakota.

CHART OF METAL PRICES FOR 1914-1915



Metal Prices, January 10, 1916

NEW METALS.

	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	23.25
Electrolytic, carload lots	23.75
Casting, carload lots	22.50
TIN—Duty Free.	
Straits of Malacca, carload lots	41.75
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets 20%. Pig lead, carload lots	5.90
SPELTER—Duty 15%.	
Brass Special	18.25
Prime Western, carload lots, nominal	17.25
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	65.00
100 lb. lots, f. o. b. factory	60.00
Ton lots, f. o. b. factory	55.00
ANTIMONY—Duty 10%.	
Cookson's cask lots, nominal	....
Hallett's cask lots, nominal	....
American	42.50 to 42.60
Chinese, Japanese	42.50 to 42.60
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot, Placquettes, Ingots. Blocks	45.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	6.00
BISMUTH—Duty free	nominal
CADMIUM—Duty free	nominal 1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	185.00
GOLD—Duty free	$20.67
PLATINUM—Duty free	$85.00 to 100.00
SILVER—Government assay—Duty free	56⅝

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% according to quantity	30 to 32
Silicon Copper, 20% " "	33 to 35
Silicon Copper, 30% guaranteed " "	36 to 40
Phosphor Copper, guaranteed 15% " "	28 to 32
Phosphor Copper, guaranteed 10% " "	26 to 30
Manganese Copper, 30%, 2% Iron " "	27 to 31
Phosphor Tin, guaranteed 5% " "	58 to 61
Phosphor Tin, no guarantee " "	44 to 47
Brass Ingot, Yellow " "	14 to 17
Brass Ingot, Red " "	16 to 18
Bronze Ingot " "	19 to 21
Parsons' Manganese Bronze Ingots " "	27 to 28½
Phosphor Bronze " "	18 to 19½
Casting Aluminum Alloys " "	45 to 50

PHOSPHORUS—Duty free. According to quantity	35 to 40

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
18.50 to 19.00	Heavy Cut Copper	20.50 to 21.00
18.00 to 18.50	Copper Wire	20.00 to 20.50
15.50 to 16.00	Light Copper	16.50 to 17.00
14.00 to 14.50	Heavy Mach. Comp.	15.50 to 16.00
11.50 to 12.00	Heavy Brass	13.00 to 13.50
9.50 to 10.00	Light Brass	11.00 to 11.50
12.50 to 13.00	No. 1 Yellow Brass Turnings	13.50 to 14.00
12.50 to 13.00	No. 1 Comp. Turnings	14.00 to 15.00
5.00 to	Heavy Lead	.... to 5.50
11.00 to 12.00	Zinc Scrap	12.00 to 13.00
15.00 to 20.00	Scrap Aluminum Turnings	20.00 to 24.00
25.00 to 30.00	Scrap Aluminum, cast alloyed	30.00 to 35.00
30.00 to 35.00	Scrap Aluminum, sheet (new)	35.00 to 40.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 24.00	Old Nickel	20.00 to 24.00
18.00 to 20.00	Old Nickel anodes	18.00 to 20.00

PRICES OF SHEET COPPER.

BASE PRICE, 30 Cents per Lb. Net.

SIZE OF SHEETS. Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	—
	Longer than 120 ins.	"	"	1	1½					—
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4	—	—	—
	Longer than 120 inches.	"	1	2	3					—
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	—
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9	—	—	—
	Longer than 120 inches.	"	1	3	6					—
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	—
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10	—	—	—
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6	—	—	—	—	—
	Longer than 120 inches.	1	2	4	8	—	—	—	—	—
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8	—	—	—	—	—
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10	—	—	—	—	—
	Longer than 120 inches.	1	3	8	—	—	—	—	—	—
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6	—	—	—	—	—	—
	Longer than 96 inches. Not longer than 120 inches.	2	4	7	—	—	—	—	—	—
	Not longer than 120 inches.	3	5	9	—	—	—	—	—	—
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6	—	—	—	—	—	—	—

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

	Cents per lb.
ZINC—Duty, sheet, 15%.	
Carload lots, standard sizes and gauges, at mill	23 cent basis, less 8%
Casks, jobbers' prices	23½
Open casks, jobbers' prices	24

Metal Prices, January 10, 1916

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect January 7, 1916

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.32½	$0.32½	$0.32½
Wire	.32½	.32½	.32½
Rod	.32½	.33½	.34
Brazed tubing	.36	—	.38
Open seam tubing	.36	—	.38
Angles and channels	.36	—	.38

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.34	$0.34	$0.34
Wire	.34	.34	.34
Rod	.34	.35	.35½
Brazed tubing	.37½	—	.39½
Open seam tubing	.37½	—	.39½
Angles and channels	.37½	—	.39½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

25½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	29c.	per lb. base
100 lb. to 300 lbs. in one order	29½c.	" " "
Less than 100 lbs. in one order	31c.	" " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5 6

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch		
½ inch		
⅝ inch		
¾ inch		
⅞ inch		
1 inch		
1¼ inch		
1½ inch		
1½ inch		
1¾ inch		
2 inch		

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	36c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	32c.	" "
Muntz or Yellow Metal Rectangular sheets other than Sheathing	33½c.	" "
Muntz or Yellow Metal Rod	32c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 45c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 4c. over Pig Tin. 50 to 100 lbs. 5c. over, 25 to 50 lbs. 7c. over, less 25 lbs. 9c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 50c.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	3-30			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	38c.	16%	42c.
8%	39½c.	18%	42½c.
10%	40c.	20%	45c.
12%	41c.	25%	54c.
15%	41½c.	30%	59c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	41c.	15%	47½c.
8%	43c.	16%	48¼c.
10%	44¼c.	18%	50¼c.
12%	46¼c.	30%	65½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.